

# SUPPLEMENT.

# The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE.

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

[The MINING JOURNAL is Registered at the General Post Office as a Newspaper, and for Transmission Abroad.]

No. 2584.—VOL. LV.

LONDON, SATURDAY, FEBRUARY 28, 1885.

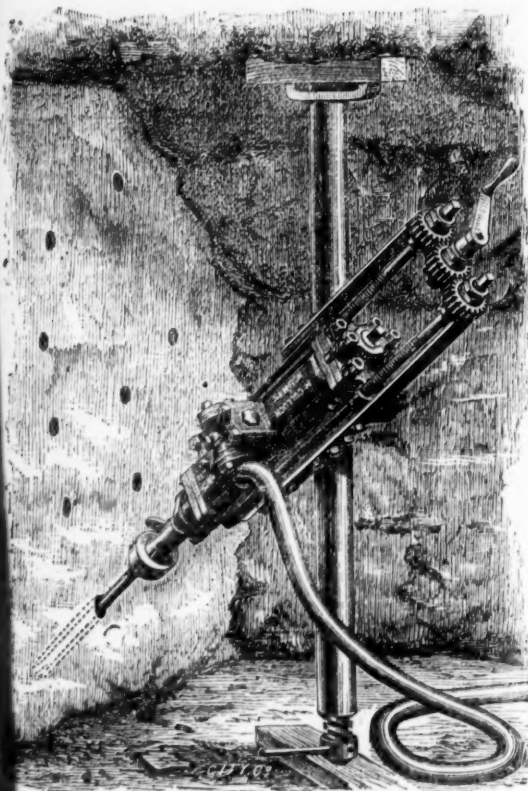
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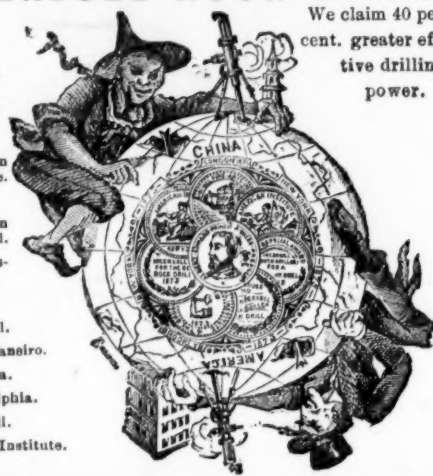
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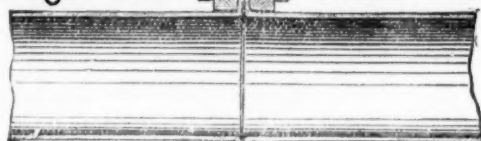
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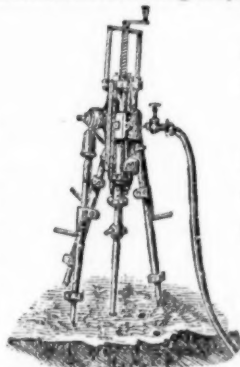
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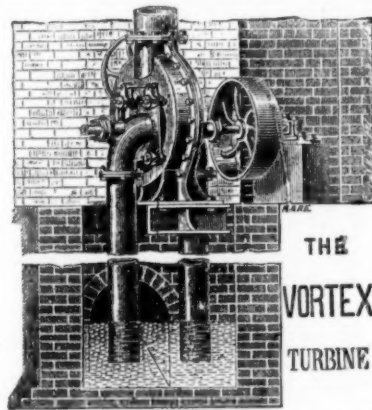
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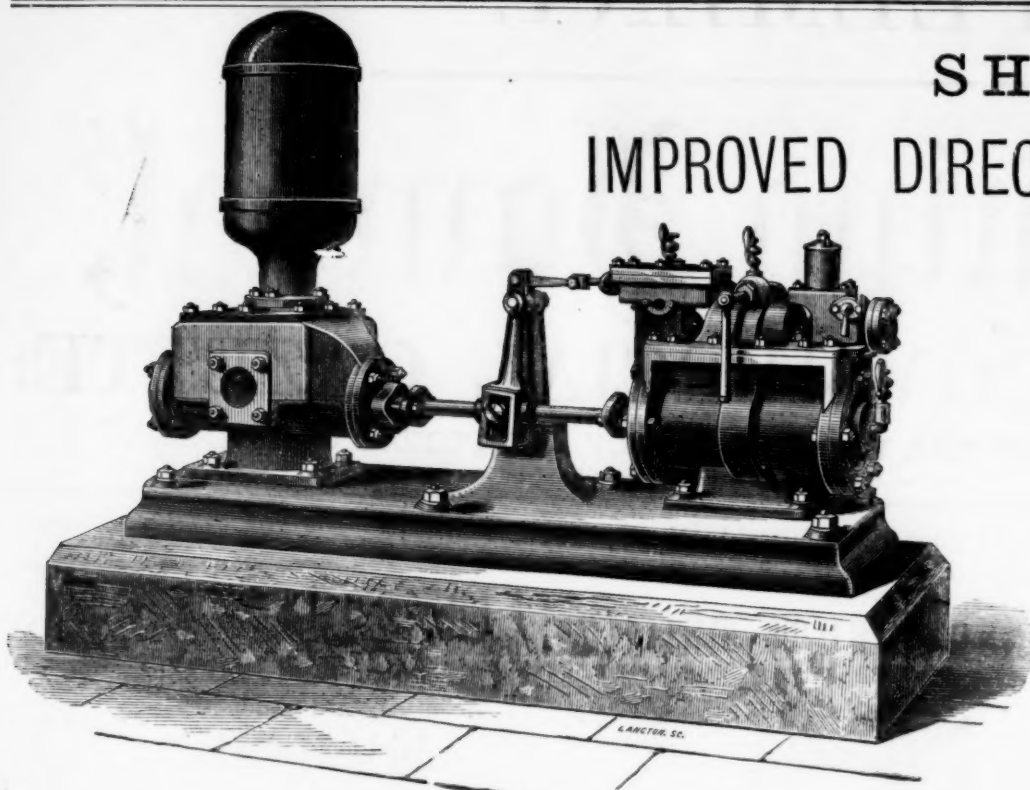
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BELL'S PATENT ASBESTOS BLOCK PACKING for High Pressure Engines  
The following testimonials refer to this Packing:—

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DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—“The Asbestos Packing is the best thing ever brought here.” It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,  
T. F. EVANS,  
Late H.M. Inspector of Metalliferous Mines.  
Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,  
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,  
G. H. CLARKE, Sup. Engineer.  
Department of the Director of Navy Contracts,  
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... Square.  
To Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that  $\frac{1}{4}$  in. thick of incrustation causes a waste of 15 per cent. of coal;  $\frac{1}{2}$  in., 50 per cent.;  $\frac{3}{4}$  in., 150 per cent.

Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel.

It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient.

Sold in drums and casks bearing the Trade Mark, without which none is genuine.

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To Bell's Asbestos Works.

DEAR SIR,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.

I am, dear Sir,  
Yours faithfully,  
THOMAS WINTER, Colliery Engineer.



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BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—  
Temperature on Plates - 198 deg.  
Covering - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refer to this Covering:—  
DEAR SIR,—It may interest you to know that we have exactly 48 per cent. in fuel through using your covering.

Yours truly, W. SANTO CRIMP, C.E., F.G.S.  
The Tamar and Kit Hill Granite Company (Limited),  
Gunnislake, Tavistock, 8th April, 1884.

DEAR SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coal, and have effected a great saving in the time it takes to get up high gentries, which is often a matter of great importance to us. I should add that the crane runs on Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,  
W. J. CHALK, Assoc. M.Inst.C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE SHEETING, for making every class of Steam and Water Joints. It can be best used in the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from  $\frac{1}{4}$  in. to 3 in. wide, and any thickness from  $\frac{1}{4}$  in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at any price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and  $\frac{1}{2}$  millimetre to 25 millimetres thick. Each sheet bears the Trade Mark. The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.

Admiralty, Whitehall, S.W., 17th May, 1884.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT).—This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Water is protected from the action of heat and grease by an outer coating of vulcanized Asbestos cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

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Safety Fuse is  
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in wet ground.  
Fits the  
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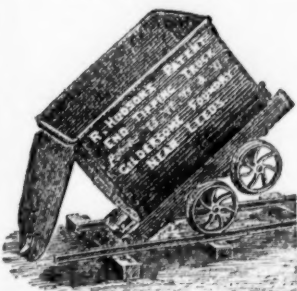
UPWARDS of 25,000 of these Trucks and Wagons have been supplied to the South African Diamond Mines; American, Spanish, Indian, and Welsh Gold, Silver, Copper, and Lead Mines; Indian and Brazilian Railways, and to Railway Contractors, Chemical Works, Brick Works, and Coal and Mineral Shippers, &c., &c., and can be made to lift off the underwork, to let down into the hold of a vessel, and easily replaced. They are also largely used in the Coal and other Mines in this country, and are the **LIGHTEST, STRONGEST**, and most **CAPACIOUS** made, infinitely stronger and lighter than wooden ones, and are all fitted with R. H.'s Patent "Rim" round top of wagons, requiring no rivets, and giving immense strength and rigidity. End and body plates are also joined on R. H.'s patent method, dispensing with angle-irons or corner plates.

Patented in Europe, America, Australia, India, and British South Africa, 1875, 1877, 1878, 1881, and 1883.

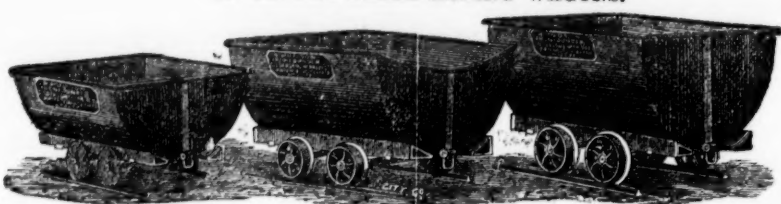
N.B.—The American, Australian, Indian, and Spanish Patents on Sale.

#### CAN BE MADE TO ANY SIZE, AND TO ANY GAUGE OF RAILS.

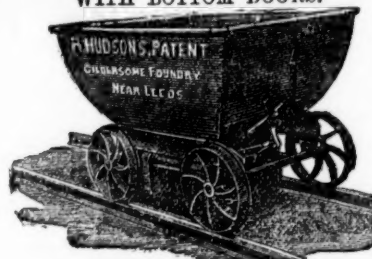
1.—PATENT STEEL END TIP WAGONS.



7.—PATENT STEEL MINING WAGONS.

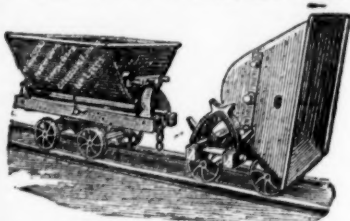


12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



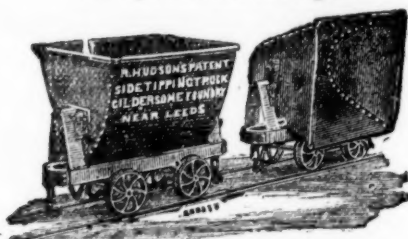
2.—PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK.

Will tip either side or either end of rails.

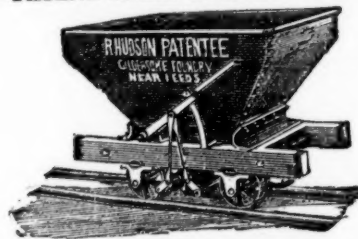


8.—PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS.

Will tip either side of Wagons.



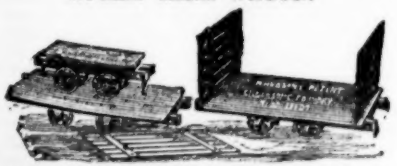
13.—PATENT STEEL HOPPER WAGON.



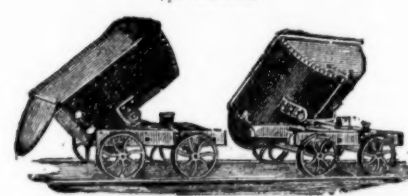
3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.



4.—PATENT STEEL PLATFORM OR SUGAR CANE WAGON.



9.—PATENT STEEL ALL-ROUND TIP WAGON.



10.—LEFT-HAND STEEL POINT AND CROSSING.



14.—SELF-RIGHTING STEEL TIP BUCKET.

(The "CATCH" can also be made SELF-ACTING if desired.)



15.—R. Hudson's Patent Steel Cago and "Fallers," &c., complete.

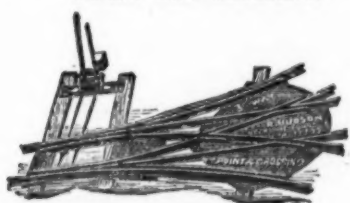


5.—PATENT STEEL CASK.

As supplied to H.M. War Office for the late war in Egypt. DOUBLE the STRENGTH of ordinary Casks without any INCREASE in weight. (Made from 10 gals. capacity UPWARDS to any desired size.)



11.—RIGHT AND LEFT-HAND STEEL POINT AND CROSSING.



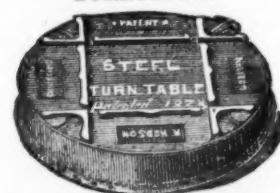
16.—PATENT STEEL WHEELBARROWS.

Made to any Size. Lightest and Strongest in the Market.



A great success.

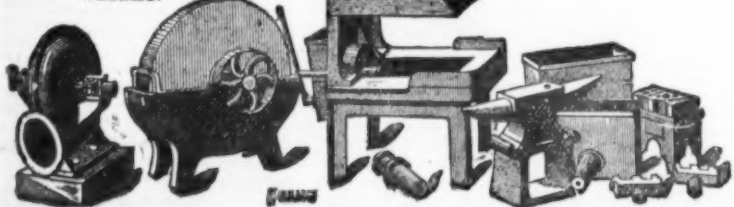
17.—STEEL SELF-CONTAINED TURNTABLE.



(Also made in CAST IRON for use where weight is not a consideration.)

6.—ROBERT HUDSON'S PATENT IMPROVED IRON SMITH'S HEARTH, NO BRICKWORK REQUIRED.

A Special quality made almost entirely of STEEL, effecting a GREAT SAVING IN WEIGHT.



Large numbers in use by all the principal Engineers in this country and abroad.

18.—"AERIAL" STEEL WINDING TUB.



Largely employed in the South African Diamond Fields.

No. 19.—PATENT STEEL CHARGING BARROW.

DOUBLE the STRENGTH & much LIGHTER than ordinary Barrow.



ALL KINDS OF BOLTS NUTS, AND RIVETS MADE TO ORDER ON THE PREMISES



Pumping Engines  
for  
Mines, Water Works,  
Sewage Works,  
and  
General Purposes.  
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APPLICATION.

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This ROCK DRILL is the result of an extensive and practical experience, and was designed to overcome the proved defects in the leading Rock Drills now in the market.

The following important points are secured in the "HIRNANT" ROCK DRILL:—

**GREAT ECONOMY** in motive power.

**GREAT DURABILITY** as the destructive shock common to the Cams of ordinary Rock Drills is ENTIRELY overcome.

**THE CAM** is locked at each end of the Stroke whilst the blow is delivered.

**PROVISION** to take up any slack in the Feed Screw arising from wear.

Four No. 3 "HIRNANT" Rock Drills have been for the past 15 months, and now are, in **DAILY USE** boring the Hirnant Tunnel, North Wales, for the Liverpool Corporation New Waterworks, together with complete plant, including

**PATENT ROCK DRILL CARRIAGES,  
PATENT AIR COMPRESSORS,**

OUR OWN MANUFACTURE, may be seen at work at any time by appointment.

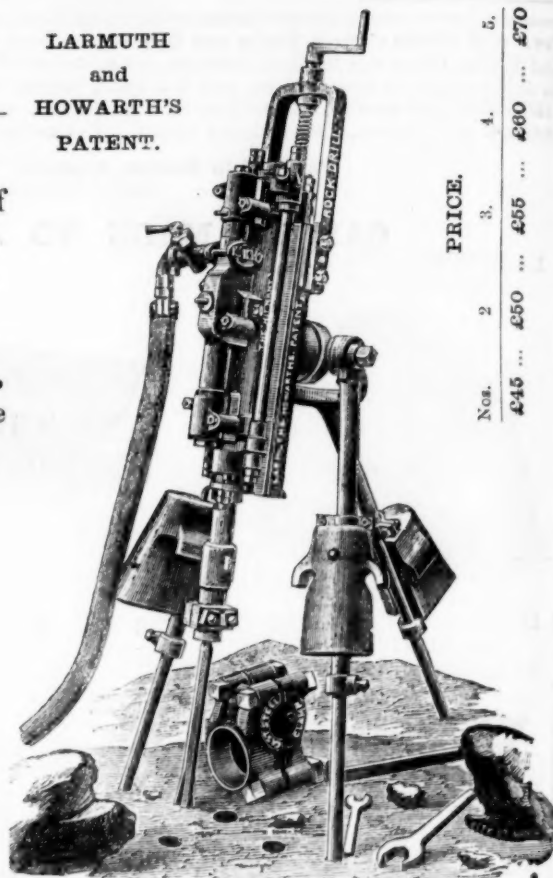
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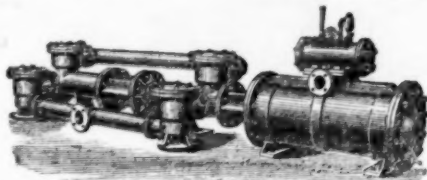
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### MINING IN MEXICO.

A well-informed Correspondent writes:—The fact that Mexico is a country where rich mines are to be found is, I believe, undisputed, yet very few of them have found their way into the English market. The reason for this is not difficult to find. The Mexicans are great miners, and when they find a good mine they work it themselves, and do not look for purchasers. Should a purchaser present himself he would be able to buy the mine at a reasonable price by purchasing the shares of individual shareholders; but should he try to buy the mine from the company—that is, working it—he would find himself confronted by the most extravagant pretensions. Owing to the previous unsettled state of the country a great many districts have not been worked at all, and some that were worked at the time of the Spanish dominion were, and are, abandoned, as, except in the neighbourhood of the towns, life and property were not secure. Mexico has now, however, turned over a new leaf. The country has been at peace for over eight years. Two Presidential elections have passed without revolutions, railways have been made, and mines can now be, and are being, worked in outlying districts with security. Mining property in Mexico is very easily acquired, thanks to the excellent mining laws of the country. The right to work any lode that is not actually being worked for an extent of about 1 mile can be obtained by claiming it before the proper authority at a cost, in most cases, of less than 100l. The Mexican mines that have lately been offered on the English market have been acquired by men who have gone to Mexico to look for them with the object of selling them to a company, and who, naturally, have to be well remunerated. If a syndicate were formed to send competent persons to purchase or to claim new or abandoned mines, and to put them in a proper state of development, and then to form companies to work them, good mines would be secured to the profit both of the syndicate and of the public.

### THREATENED REDUCTION OF MINERS' WAGES IN YORKSHIRE.

A correspondent writes:—Although no mention of the matter has been made to any of the officials of the Yorkshire Miners' Association, it is stated on good authority that colliery owners have decided to make a reduction in the men's wages. The feeling which this has created amongst the men is very strong, and there is little doubt that if a reduction is attempted they would strike against it, and fight the question severely, and with considerable rancour. The men argue that although the 10 per cent. advance obtained two years ago is still on the tonnage rate, the men are no better off than they were before it was obtained, so many concessions having been obtained by the owners in other ways. The meeting at which the reduction was proposed represented not one-half as was stated, but less than one-third of the output of the Yorkshire coal field, and so it is hoped the attempt will not become general over the district.

One thing, however, is certain—if an attempt is made to take off the 10 per cent. it will be stubbornly resisted; the Yorkshire Miners' Association being now in better condition than it has been for years, both as to funds and members. It is stated that the officials of the above Association have decided to call a conference to which every pitstead of men throughout the whole of South and West Yorkshire will be invited to send representatives for the purpose of fully discussing the state of affairs. The conference will probably have the effect of causing the owners concerned to change their minds, for certainly the recent events in this important coal district of England show that the miners feel they have suffered long and badly enough, and that they will submit no longer. They consider their wages at present low enough without such attempts to lower them further.

**LIQUIDATION MEETINGS.**—A meeting of the Northern Lead Mining Company is to be held on March 23, for the purpose of showing the manner in which the winding-up has been conducted, and a meeting of the Rocks Tin Mining Company will be held on March 20 for the same purpose.



## Original Correspondence.

## YIELD OF GOLD IN VICTORIA, 1884.

SIR.—The yield of gold for the past year shows an increase over that of 1883 of 33,957 ozs. In 1883 there was a falling off, after a high production for three years, but gold mining is again in the ascendant, and the outlook for the new year is very hopeful indeed. For 1884 the yield was 774,330 ozs., value about 3,000,000*l.*, or within 37,762 of the output of 1880, when mining revived, after touching its lowest point in 1879, the returns for that year being 718,208 ozs.

The Sandhurst district, as shown by the dividends, keeps the premier place, and Creswick comes next. In both these districts mining is regarded by experts as being still in its infancy, and sanguine hopes are held for the future. Satisfactory progress is being made at the Berry Consols, the Berry No. 1, Hepburn Consols, Hepburn No. 1, Australasian Extended, Lord Harry, and the extensive prospecting now in progress in the quartz districts. The Ballarat field, with its surroundings, has a brighter outlook at the end of 1884 than it had at its commencement.

From the Sandhurst district equally satisfactory reports are given. The best yields were obtained in the second half of the year, and the closing month was much the highest. Good payable quartz has been got at such depths as 1500 ft., 1690 ft., and 2000 ft.—discoveries which mean opening a new Sandhurst. Every increased foot in depth at which payable gold is found means the adding of years to the permanency of the gold production of the district. It is not merely of local importance, but such discoveries have a national import of greater value than is generally accounted for, as it proves that if one or two quartz reefs are payable when prospected at 2000 ft. in depth, that there is every probability of other reefs in the district and throughout the colony might turn out as well. The returns for the past 10 years were as follows:—

Year.	Ounces gold.
1874	1,102,614
1875	1,058,823
1876	937,260
1877	792,839
1878	753,793
1879	718,208
1880	812,092
1881	886,416
1882	879,481
1883	740,373
1884	774,330

Total ..... 9,456,229

The following table is the gold mined and exported for the past two years:—

	1883—Ozs.	1884—Ozs.
Gold mined	399,186	562,708
Exported, bars	393,443	189,866
" specie	£2,251,278	£1,249,297

It will thus be seen that while the colony of Victoria in the year 1883 exported bar gold and coin to the amount of £3,825,050 during last year the exports were only £2,010,172

Less gold exported in 1884 ..... £1,814,878  
The retention of so much more gold within the colony this last year is a matter of great import both to the colony and England, for in Victoria it means the utilising of the gold within its Territory for the development of its own resources and industries, thereby enriching its own community instead of sending it all abroad to benefit other people.

THOMAS CORNISH.

## NORTH QUEENSLAND: WILD RIVER.

SIR.—The actual machinery on this field consists of as follows.—At Herberton the Herberton Tin Mining Company's crushing machinery, and that of the Herberton Co-operative Company. The Monarch Company has a very superior crushing machine at Nigger Creek, about 2½ miles from here; the proprietary have, however, lately changed. At Watsonville, distant about 8 miles, there are two crushing machines, belonging respectively to the Great Western Company and the Herberton Bischoff Company. At Coolgarra, 30 miles distant, there is another crushing machine; and at Irvinebank, about 20 miles, there is also a very superior one.

The discovery of tin in this district took place in November, 1879, and the first mining operations occurred on May 8, 1880, and on Oct. 30 of the same year the first mining licenses were issued. The arrival of the first crushing machine was in November, 1880. The export of tin from this district to March 31, 1884, has been 6970 tons, valued at 383,350*l.*, for which 62,730*l.* was paid for carriage from here to the coast. The number of mineral leases issued was, at the above-mentioned date, 175, covering an area of 1801 acres, and the revenue collections therefor amounted to 2525*l.* 6*d.*

The object of these statistics is to give an idea of the very young age of the tin fields of this district, which already produces three-fourths of the tin produced in the colony of Queensland, and the field has been simply scratched over, as only a few claims have achieved anything like a depth. During this brief period Herberton, the principal town, has been formed, and a large capital has been expended in land and buildings, including fine hotels, extensive stores, and private residences. The Government buildings are very light and handsome. These consist of a court-house, police quarters, post and telegraph offices, hospital, State school, and explosives magazine. There are also a Roman Catholic chapel, and a Primitive Methodist church, a fine school of arts, and a fine municipal hall is about to be erected. Watsonville is the second tin mining centre, then Irvinebank, Coolgarra, Thomson's and Emu Creeks, California Gully, and Raraka Creek, besides a few lodes that are found outside of these places. Newellton and Silverfield are silver centres where there are some very fine shows. At the first-named place there is a smelting apparatus imported from San Francisco. Somewhere or four miles from Coolgarra there is an extensive and rich copper lode, and from there runs a well-defined outcrop for some miles to the grand copper property known as Mount Garnet, which, worked with English capital, would be the finest copper and silver property in the colonies, and perhaps out of them. Antimony is being exported to England from Northcote.

The coastal outlets just now, where the minerals are shipped, is Port Douglas, a coach road, and Cairns, a pack route. From the latter place the permanent survey is being made, and probably the railway will be constructed in three or four years. The geological aspect of the country has been fully reported on by Mr. R. L. Jack, the Government Geologist, and the Rev. Tension Woods, the latter designating this district a second Cornwall.

The elevation is nearly 3000 ft. above the level of the sea, and although within semi-tropical latitudes, the climate is most pleasant, enjoyable, and healthy, and capable of growing fruit and produce of every description. When the railway is completed it is expected that families from the south and north will resort to this town during the summer months to enjoy its salubrity.

I omitted to mention that the "boss" claim hereabouts is the Great Northern prospecting claim, a freehold of 60 acres, and the stone therefrom will always keep a machine going. During the four years' existence of this district the agricultural industry has also made rapid strides, and settlement has taken place all round. The quantity of land selected is 27,500 acres. At about 10 miles from here there are several millions feet out in the log awaiting a flood in the Barron river to float them to the port of Cairns for shipment, or in default of which they will have to remain until the railway reaches that point to take them away.

EDWARD MYERS.

Herberton, Dec. 8, 1884.  
A long drought has of late visited all parts of Queensland, seriously affecting the interests of squatters and other industries. In this district its effects have also been experienced, but not to the extent suffered by those who raise stock.  
The periodical thunderstorms have, however, commenced here, and the welcome showers of rain have already done good service. The declension in the price of tin in the home market has considerably militated against the local industry. Here, miners' wages are

high—3*l.* 10*s.* weekly—and carriage to the coast is an item nearly equal in proportion to the wages, and sometimes far beyond it. Hence, the unaccountable fall in the tin market generates alarm, and checks operations seeing that no legitimate cause is advanced, and that the stocks quoted in the *Mining Journal* are far from being extravagant.

Stream tin, of which there are large quantities in the district, will be now sluiced, and every endeavour is being made to test an alluvial lead running from Herberton to a known distance of about 6 to 8 miles. If the local capital be sufficient to carry out the test, and it prove successful, it will be a big affair, and afford remunerative employment to many hundreds of men for an unlimited period.

Herberton is surrounded by hills, which renowned geologists tell us are full of tin requiring but capital to extract it. If British capital found its way into this district in lieu of being thrown away upon fanciful mines in foreign countries, dividends would be the rule as they are now very rare exceptions, and investors would have the advantage of seeing the results of their speculations assured by British law, order, and integrity. The Wild River tin fields, worked by British capital and British labour, would create an antipodean Cornwall, and ensure a never-failing supply to the British market without reference to what foreign complications might lead to. The supply of tin from here would be simply inexhaustible, reliable, and of higher percentage than can be produced in any part of the world.

The same may be said of its copper, experts showing that no copper assaying higher is being introduced into England. There are several well-defined copper lodes hereabout assaying high. There is one freehold property known as Mount Garnet, which is unworked for the want of capital, but which, if undertaken by a British company, would produce an inexhaustible supply of copper and silver.

Within three or four years the railway from here to Cairns will be constructed, when metals and minerals will go from here at a cheap rate, and be shipped at the port of Cairns direct home.

Within a short period tin will be smelted at Irvinebank, about 16 miles from here, and it is expected that silver will be smelted at Newellton, about 8 miles away, all tending to cheapen carriage of the original material. I may here advert to the circumstance of the name of this prolific tin field being unknown to you, and that of Queensland being equally unknown in the London metal market as a producer of tin—a fact proved by a return placed on the table of the House of Commons showing that Queensland, in 1883, only exported to Great Britain 22 tons of tin ore, whereas from this district alone in that year tin was exported to the amount of over 151,000*l.* There has been no smelting in operation here, consequently all the ore and stream tin has been sold in Sydney, New South Wales, where smelting operations are carried on, and the smelted metal being shipped there is imported into England as the produce of that colony, hence the name of Queensland as a producer of tin became wholly obliterated, and necessarily so the actual locality of the mines. This will, of course, right itself if smelting be carried on extensively in this district, and a smelting establishment is also in full swing near Brisbane. The great traffic, via Torres Straits, by the B. and I. steamers and other companies will materially influence the home trade with this district if British capital be attracted to it, as machinery from home or metal to Europe will be discharged or received at Cairns, where the vessels pass, and so be brought either way by rail at a minimum rate of carriage.

Herberton, Dec. 15, 1884.

EDWARD MYERS.

## O S C A R.

SIR.—Much disappointment has been felt, naturally, in consequence of the last report from the Oscar Mine, the shares having fallen 10*s.* each. Now, is it reasonable to conclude that this property in its first efforts should be depreciated 35,000*l.*? And is it wise that shareholders should throw away their holdings at these prices, a price that entails a loss upon the actual subscription of nearly 10*s.* per share? Referring to the very strong report by Capt. Plummer (an expert of great experience and reliability, the present captain at Mysore Mine), which was issued when the Oscar was introduced by Mr. Murchison, and also to the assays, and as to the latter, by other parties, giving startling results, as well as the 29 cwt. which Mr. Murchison had blasted down in his presence at the mine, which he brought home, and actually produced over 15 ozs. of gold, we are forced to the conclusion that the agent at Oscar has been stamping rock which has little or no gold in it; doubtless in his desire to show the capabilities of his stamps he has run this barren stuff through the mill. We ask where did this stamp stuff come from, and find that he has been cross-cutting away from his riches; in fact, the first return was about 2 oz. to the ton, the second about ½ oz., and the last 20 oz. from 368 tons—this from the 12 fathom level.

I am glad to hear that he now is at work at the bottom of the shaft where he began and should have remained, even if he had stamped a smaller quantity of stamp stuff. It is useless to stamp country rock, which is fit only for the construction of roads and tramways. Mr. Daw, sen., has left for the mine, and will soon restore confidence by results, and his superior judgment in this line of things. Young Capt. Daw has certainly pushed all the works forward with great rapidity, and deserves much credit for his labours. The stamps are working well; there will soon be 50 heads going, and if he sticks to the lode and lets others try experiments he will probably verify the truth of all Capt. Plummer has said and written concerning this property, which can be worked more cheaply than any gold mine in the world. Shareholders must decide for themselves whether it is a better time to sell at a heavy loss or buy in and average what they hold.

Peterborough, Feb. 23.

## ORE DRESSING

SIR.—A great deal of attention has been given, especially of latter years, to the dressing of tin and lead, whilst the treatment of copper ores scarcely receive a passing note, but year after year, from time immemorial, the same old routine is gone through. Why this should be so it is difficult to understand, except for the reason given last week by one of your correspondents on the question of tin dressing—the extreme difficulty of introducing anything new in Cornwall.

Nothing can be of more importance in these times when the standard of copper ores is so low than the rejection of so much of foreign matter as possible, as the mining companies have to pay as much for returning a ton of waste as a ton of ores, and in this way many thousands of pounds are lost yearly to mineowners. I will venture to say more a great deal than the loss of slimes in the Red River and all the rivers besides in Cornwall. For example, take a mine selling 400 tons per month at 6 per cent., if one quarter of the waste were extracted that would be equal to 275*l.* saved in returning charges, or 3500*l.* in the year.

It may be averred that this cannot be done without great loss of ore in slimes, &c., and what may be gained in one way would be lost in the other. Now, I am not writing on a subject that I do not thoroughly understand, having paid especial attention to the matter, and having had many years' practical experience, and I am quite sure that the average produce could be brought up to 9 per cent., instead of the present average, with but very little, if any extra, cost, and with no extra loss of ores.

Of course, it is said that, by close jiggging, a great deal of ore is necessarily lost. But, I ask, is there not a great deal of loss in the present system in use in some of the Cornish mines. The "dragge" ore is crushed and passed through a screen or riddle of coarse mesh, and then jiggged in a most rude manner—indeed, it might be rather called sifting than jiggging—and, for want of finer crushing, a great deal of ore remains attached to the fragments of foreign matter, which, of course, is thrown away in the waste; and, in order to save it, or some portion of it, this waste is crushed again, or stamped, and, in the latter case, the richest ore is reduced to an impalpable powder, the necessary result being the great portion goes away in the water as slimes. So much for the present system being an economical or inexpensive one.

I had myself no difficulty in getting up the average produce from 7 per cent. to 11 per cent. with one single operation, and there could be no ore found in the "raff." Three things are necessary to success. First, careful selection; secondly, proper attention to the

right size crushing; thirdly, a carefully adjusted and well balanced jigger.

I have not the slightest doubt that I shall be stigmatised as a fanatic, or something worse; but if I can be the means of arousing an enquiry into the question of copper dressing, as has been done by others in the matter of tin, my object will be gained.

JOHN ROBERTS, M.E.

Bryn Crafant, Trefim, N.W., Feb. 24.

## MINING IN MONTANA.

SIR.—It may not be generally known that the mining industry in the Territory of Montana U.S.A., is at present only in its infancy. I recently returned from an inspection of some of the principal mines in the vicinity of Helena, Wickes, and Butte, and am so impressed with the enormous resources of that district, that I am afraid I would be regarded in the light of a visionary if my views were fully published. The mines in question are principally low grade, copper, and silver mines, assaying from 25 to 48 per cent. of copper, with an average of about \$25 per ton of silver. At the Anaconda Mine alone there was more than 100,000 tons of low grade ore on the dump which the working foreman—a Welshman—estimated would realise not less than \$25 a ton. At that mine the output is carefully graded, and the ore assaying 40 per cent. of copper, and \$40 of silver or more per ton is shipped to the Atlantic Coast and to Newport, Monmouthshire, for reduction, the balance of the ore being dumped. The writer was told that it was the intention of the Anaconda owners, who, by-the-bye, are some of the rich San Francisco people, to erect smelting-works there and reduce the ore in question, as it hardly pays to ship the ore now on the dump as far as South Wales, in England, for reduction, or rather does not pay that profit which would satisfy most English investors.

One of the new districts is at Wickes, about 25 miles south-west of Helena, the capital of Montana. The mines in this vicinity are extremely rich, and are owned and operated at present by some of the wealthy men in the town of Helena.

Mr. Sam Hauser, the President of the First National Bank at Helena, and the sons of Mr. J. Seligman the New York banker, are interested in developing some of the properties at this point. A year and a-half ago a branch railroad, about 24 miles long, was constructed from the main line of the Northern Pacific Railroad, near Helena, to Wickes, and in less than one year the cost of the branch was repaid by the carriage of ores transported from the mines to Lake Superior, where they were shipped by water to Newark, New Jersey, for reduction. Mr. Hauser, whom the writer had the pleasure of meeting at Helena, urged that a very profitable investment could be made by those understanding the business by erecting a large smelter at the town of Superior, on Lake Superior, whence most of the low grade ores from Montana are shipped, and there reshipped to New Jersey. It would save the shippers large sums annually; the site for the mills is extremely favourable, there being every requisite, coal being delivered there by Lake steamers at low cost.—London, Feb. 25.

MONTANA.

## CANKIM BAMOO GOLD MINING COMPANY.

SIR.—Could you or any of your numerous correspondents inform me what has become of the above company? On calling at the company's office I found it had been shut up for months, and have since learned that the managing director had resigned, and it is reported the Chairman has resigned also. I suspect the 74,000*l.* of subscribed capital has disappeared within the last two years, and little to show for the money; but the 3000*l.* worth of machinery, which the Chairman stated at the meeting in June last, he found lying on the banks of the river in March—is it still there or on the mine—also an iron house, which would cost at least 200*l.* before reaching Africa? What has become of the above property, and why was the mine closed down, seeing the Chairman gave such glowing accounts of it on his return from the coast? Nay, he went farther, and expressed his entire confidence in the venture. The Chairman's account was corroborated to the letter by an experienced Australian expert, and I have been informed since that the manager had found payable gold after the Chairman's return from the mine on both the Cankim and Kythia properties—if so, why are matters at a stand? The Chairman stated at the last meeting that there was a want of "moral power" somewhere. This want appears to rest with the board, or why do not they lay their difficulties before the shareholders? Have they sufficient left to draw their fees? It must be evident to every shareholder as well as myself that we are sadly in want of a chairman, managing director, or a secretary, to look after the affairs of the company, consequently the machinery and other effects must be put to ruin in such a humid climate as Africa. It is high time for the shareholders to look after their own interest, as the board (if any exists) seems, as the Chairman expressed it, to be inclined "to let things slide." Could a meeting of the shareholders not be called, and the manager and other employees asked to attend, and all possible information got as to the property, and thereafter steps taken to secure and realise the machinery and other effects, and dispose of them for the benefit of all concerned.

London, Feb. 24.

A SHAREHOLDER.

## CAN A MINE BE WORKED BY ELECTRICITY

SIR.—Referring to "Miner's" letter on the above in your last Journal, if he will be good enough to put himself in communication with us in this matter, giving full particulars of the amount of power, &c., required, we shall be pleased to submit a scheme and estimate for the transmission of power along the distance named by means more economical and effective than electricity, and to enter into a contract therein.

WARBOP AND HILL.

Nottingham, Feb. 23.

## THE PRINCE OF WALES MINE AS A TIN MINE.

SIR.—Much has been said from time to time on the merits of this mine as a tin mine in depth. The main lode has been gradually changing in depth from copper to tin and is still undergoing such a change.

Some 17 or 18 years ago Mr. W. Michell, of Austin Friars, and myself inspected this mine, and were unanimous, in our opinions, that the change then going on in the lode from soft quartz to a light blue capel containing tin was a true indication of a tin lode in depth. Every fathom sunk since then has gone to confirm that opinion, and I have now no doubt whatever that the new discovery of two tin lodes at the 50 fathom level in Drakewalls are a portion, if not the actual main lode in the Prince of Wales Mine.

No better course can be adopted than to go on sinking the engine-shaft in the Prince of Wales Mine for some 25 or 30 fathoms deeper, and I fully believe the shareholders will be rewarded by opening a rich and profitable mine.

Drakewalls Mine, Feb. 24.

THOMAS GREGORY.

## NEW AND OLD MINES.

SIR.—Nothing can be more self-evident than some of the old and deep mines in Cornwall cannot hold out much longer unless there be a great change for the better in the metal markets, which at present seems rather improbable; and the richer or more fortunate ones must come to an end in this or the next generation. Under circumstances of this kind what is to be done? Is mining to become a thing of the past? Why, if people keep pottering in deep old mines to the neglect of new ground there is nothing else for it, and Cornwall will be a "wilderness of desolation" not many years hence.

But there is no reason that it should be so. There is still a plenty of virgin ground in the county, and lodes yet untried as favourably situated as those that have proved so rich in the old mines, which, were they worked, would doubtless prove more remunerative than the expensive old mines of the present day. It seems passing strange how but little is thought of working an old mine at a loss of from 500*l.* to 1000*l.* per month, whereas the loss of as many shillings in a new shallow mine is looked upon as something enormous. There is but little doubt that if half the money lost in worked-out old mines were spent in new ground the result would be far more satisfactory.

It is pleasing to learn that something has been started in this



direction in the Old Wheal Vor district, and bids fair for a great success. I allude to Metal and Flow Mine, which is on the Wheal Vor Metal and Schneider's lodes, and which on the vertical junction of the two formed the rich course of tin for which that mine became so far-famed. I have had every opportunity of becoming acquainted with this district, and particularly these mines at the time they were at their richest stage. As the result of the working of these lodes by the Wheal Vor Company is so well known it would be useless for me to enter into that matter; but it may be interesting to some, or even to many, to know that there are here the same chances of success as they had in the Metal Mine. The same lodes, the same formation, and all the same conditions under which the tin was deposited in that mine; and nothing can be more reasonable than to hope for, and expect equal results, which would result in much larger profits than were realised by that company, because there would not be the enormous cost of carting, and the modern improvements in winding and some other matters would lessen the expenditure of working by a very considerable item.

It is desirable to one and all that the great expectations should be realised, as it would be an incentive to try other new mines, and so, as it were, begin a new era in Cornish mining. Mining speculations will be carried on more or less in the future as they have been in the past, and since men are to be found that will speculate, why squander money in old worked out mines when, as I have said, there are a plenty of new ones that can be worked on one quarter part of the expense.

JOHN ROBERTS, M.E.

Bryn Crufnant, Trefrin, N.W., Feb. 26.

#### SHROPSHIRE LEAD MINES.

SIR,—We hear that operations to some extent are likely soon to be resumed at the Tankerville Great Consols Company's Mines. We shall be very glad to see this take place and to see them pay the men the remaining 12s. 6d. in the pound of their wages for the last two months' working. Many of the miners' families here are very badly off.

We should like to see the South Roman Gravels Company resume the sinking of their new engine-shaft in right good earnest, for we fear there is not much prospect of a discovery of any importance at the depth of their adit level, and it is only a waste of time and capital to make explorations in unproductive beds of ground. Why not send the shaft down where their prospects are good?

The plant at Ladywell still remains on the mine and no doubt will be used there at some future time. Roman Gravels is a good mine of great length. The plant at East Roman Gravels is still intact and the miners' wages unpaid.

MINER.

#### KAPANGA GOLD MINING COMPANY (LIMITED) IN LIQUIDATION.

SIR,—Your readers will no doubt remember my letters to your Journal, prior to the above company going into liquidation; and the views I entertained then have been fully verified by the present position of this company's affairs. A circular has now been issued by the joint liquidators, bearing date Feb. 25, inviting more funds to be sent in for the purpose of the mine being examined by a "thoroughly competent agent." I was under the impression that Captain Argall, who is now at the property, made his report last year, and was satisfied that the mine is a valuable one. As I ventured to point out in a former letter the history of this company has been a history of glowing reports and constant applications for fresh capital. In their circular, the joint liquidators say that they find it necessary to place before the members the present position of affairs, and "have carefully and exhaustively considered the matter." . . . and invite "an immediate subscription of 6d. per share." I should like to ask what is the present position of affairs, and what result is likely to accrue to members subscribing?

The failure of the Kapanga Mining Company (Limited), and of the previous company, the New Zealand Kapanga Company (Limited), is due simply to the want of management, a word which does not appear to be in the vocabulary of those gentlemen who have been at the head of affairs.

There is one other point in the circular I have referred to—that those declining to subscribe to the fund in question will not "be entitled to any interest in the new company in respect of his present holding."

What section of the Companies' Acts permits confiscation by joint liquidators without compensation? W. WM. BAKER, Small-street Court, Bristol, Feb. 26.

#### THE RAILWAY BILLS.

At the annual session of the Associated Chambers of Commerce, on Tuesday, the following resolution was unanimously carried:—"That this Association, finding that by these Bills the railway companies propose not only to increase considerably their *maximum* rates, but also to legalise terminal charges, subject only to a costly and troublesome appeal to the Railway Commissioners, urges upon each chamber interested the importance of at once giving notice, under the new Standing Orders, of their intention to oppose one or all of them in Committee, and to take also strenuous steps to prevent their Bills being read a second time; also that a committee be nominated to organise opposition to the Bills in question, and to take joint action with others in opposition to the Bills in Committee, in the event of the Bills passing the second reading, and with power to consult with the representatives of railway companies."

#### COMMERCIAL FAILURES.

The number of failures in England and Wales gazetted during the week ending Saturday, Feb. 21, was 94. The number in the corresponding week of last year was 75, showing an increase of 19, being a net decrease in 1885, to date, of 204.

The failures were distributed amongst the following trades, and, for comparison, we give the number in each in the corresponding weeks in 1883 and 1884:—

	1885.	1884.	1883.
Building trades.....	9	9	26
Chemists and druggists.....	1	1	2
Coal and mining trades.....	2	1	3
Corn and cattle trades.....	3	1	—
Drapery, silk, and woollen trades.....	10	8	22
Earthenware trades.....	2	2	4
Farmers.....	5	3	16
Furniture and upholstery trades.....	3	1	6
Grocery and provision trades.....	20	6	38
Hardware and metal trades.....	3	4	7
Iron and steel trades.....	5	5	4
Jewellery and fancy trades.....	4	4	7
Leather and coach trades.....	5	4	16
Merchants, brokers, and agents.....	4	10	28
Printing and stationery trades.....	1	2	1
Wine, spirit, and beer trades.....	5	6	26
Miscellaneous.....	12	8	22
Totals for England and Wales.....	94	75	228
Scotland.....	26	18	25
Ireland.....	6	9	6
Totals for United Kingdom.....	126	102	259

The number of Bills of Sale published in England and Wales for the week ending Feb. 21 was 262. The number in the corresponding week of last year was 253, showing a decrease of 1, being a net decrease in 1885, to date, of 45. The number published in Ireland for the same week was 11. The number in the corresponding week of last year was 18, showing a decrease of 7, being a net decrease in 1885, to date, of 45.—*Kemp's Mercantile Gazette.*

Mr. W. BEVAN, late manager of the Penrhin Colliery, has been appointed manager of the new colliery at Ynysybwll. Sinking operations are being vigorously carried on.

#### LORD LORNE, AND THE TIN-PLATE WORKERS' COMPANY

The Princess Louise (Marchioness of Lorne) accompanied the Marquis of Lorne to the City, on Tuesday, on the occasion of the presentation to him of the freedom and livery of the Tin-plate Workers' Company. The ceremony took place at the Mansion House in the large apartment called the Saloon, where the Royal and distinguished visitors were received by the Lord Mayor (Mr. Alderman Nottage), and the Lady Mayoress, the Master of the Tin-plate Workers' Company (Mr. Joseph E. Turner), the Wardens of the Company, Pastmaster Low, &c. Amongst those present to witness the ceremony were Lady Folkestone, the Baroness Burdett-Coutts; Lady Sophia Macnamara and Major Collins, in attendance on the Princess Louise; the Hon. A. Yorke, the Sheriffs and Under-Sheriffs of London and Middlesex, Lieut.-Col. Sewell, of the City Chamberlain's office, the Comptroller, and Mr. W. J. Soulsby. Upon a table were displayed a handsome embossed copy of a resolution passed on June 26, 1884, conferring the freedom and livery of the company upon the Marquis in recognition of his statesmanlike administration during his tenure of office as Governor-General of Canada, and to contain the scroll an ornamentalasket made of pure tin.

The MASTER, reminding Lord Lorne that at a meeting of the Worshipful Company of Tin-plate Workers, held last year, he had been pleased to accept the freedom of that ancient company in accordance with a promise he had made before going to Canada, said they had now met for the purpose of formally presenting his lordship with the resolution in accordance with which the freedom of the company had been offered him. The court had decided that the most appropriate depository of the scroll would be the gift which had been offered by one of their liverymen, Mr. Renter Warden Perkins, of a box made entirely of the metal with which their company had specially to do. In conclusion, he begged Lord Lorne to accept the box and scroll, which would, he trusted, for many years happily remind him of his having received the freedom of the Tin-plate Workers' *alias* Wyre Workers' Company.

The Marquis of LORNE, in thanking the Master and Company for having enshrined the diploma in a casket at once so worthy and so characteristic of the contents, said he was extremely glad to receive the freedom of one of the most ancient companies in a casket which represented in its material one of the most ancient of all British products. It had been a matter of special satisfaction to him to find that they were not forgetful of an old acquaintance, and he thought that in this they had exhibited a constancy of friendship rarely found in the present day. It was now eight years since they had done him the honour of inviting him to inspect an exhibition of the tin-plate workers' productions at the Crystal Palace. His appointment to the position he held in Canada prevented him from seeing what he believed was a most interesting exhibition. But his absence had not caused them to forget that they had been kind enough to offer him the freedom of the company, and on his return they had carried out that intention. He was extremely gratified that it had been possible for the Princess to be present with him on this occasion and to visit the Mansion House, for those halls were famous and of world-wide reputation, not merely as the head-quarters and centre of the municipal government of the greatest city in the world, but as the scene of so many philanthropic efforts to alleviate the poverty and distress which unfortunately existed in this rich centre of commerce.

A formal document relating to the taking up of the freedom of the City having been signed by Lord Lorne, the company sat down to a *déjeuner*, which was served in the Long Parlour. The toast of "The Queen," proposed by the MASTER, having been duly honoured, Mr. Low proposed "The Health of Princess Louise and Lord Lorne."

In acknowledging the toast, Lord LORNE said he could assure them that he was most proud and happy to have the opportunity, especially at the Mansion House, of formally assuming his privileges. Expressing his thanks for the manner in which the health of the Princess had been proposed and received, he observed that if the occasion had any significance beyond the pleasure of an agreeable social meeting, it was as showing that wider patriotism for which the City of London was conspicuous, and as an expression of approval of services rendered to England in the Greater England beyond the seas. In the case of the Princess he must remark that she had fulfilled a duty and a part which was expressly assigned by the Prince Consort for his children—that of helping to promote the interests of this country through the Greater Britain beyond these islands. When the last speaker said that on the horizon, in every part, things were looking extremely dark at the present moment, the Lady Mayoress had observed that there was a silver lining to the cloud in the efforts made by the great colonies of the Mother Country in the time of difficulty. He knew gentlemen personally in British North America who had made these offers, and he need not say how hearty and spontaneous those offers were, and although the Australian colonies made the offer first, and in a way which insured its immediate acceptance, yet if the war should continue, much as he hoped it would not, he trusted that those other colonists would be represented in the garrison of Cairo. Undoubtedly the Australian interests in the Suez Canal were very great, but the world-wide character of the interests of the British Empire made it desirable that the offers of all the colonies should be accepted. Reverting to the wide patriotism of the City of London, he said it was owing to that commerce which her merchants pushed to every quarter of the globe that we were prepared and determined to protect. Anyone going in a steamer on the Hudson or Saskatchewan might see the cross and dagger which were figured in the arms on the plate at that table, and which had been carried by the early adventurers under Prince Rupert to those northern latitudes. It was the same in the case of the first adventurers in India, and he feared they must look back to having had some merchant adventurers who did not leave quite such a savoury odour behind, for he believed that the famous Capt. Kidd sailed from the port of London in search of tin-plate. Before resuming his seat, Lord Lorne proposed the health of the Master, of whom he said it was alike the duty and the pleasure to provide for the distribution of the charitable funds accruing to the company among the distressed artisans and brethren of the guild.

THE CONTRACT FOR THE LLANISHEN RESERVOIR, CARDIFF.—A writ has been issued against the Mayor, aldermen, and burgesses of Cardiff by Messrs. Henry Britain, Press, Inkipp, and Crewdson, on behalf of Mr. August Krauss, contractor, of Colston-street, Bristol, and the action, which has been entered in the Queen's Bench Division of the High Court, will be tried at the next Bristol Assize. The plaintiff's claim is that he has suffered damage by the conduct of the defendants, their surveyors, and agents, with respect to the contract for the Cardiff Corporation Waterworks. On July 28, 1884, an advertisement, directed to contractors, was inserted in different newspapers, inviting tenders for the construction of a large storage reservoir, including embankments, valve, well, culverts, gauge, basin, overflow, and other works, at Llanishen. Plans and drawings were to be seen at the offices of the engineer, Mr. J. A. B. Williams, Queen's Chambers, Queen-street, Cardiff, and copies of the specifications, form of tender, and bill of quantities might be obtained from the engineer on payment of 5l. 5s., which would be returned after the receipt of a *bona fide* tender. The plaintiff alleges that the defendants had at the time no *bona fide* intention whatever of letting the contract for the execution of the works, and had determined and arranged that the contract should be given to Mr. Walker, and that the publication of the advertisement was a device to ascertain what the cost of the works would be when they were executed, and partly a device to shield the corporation from public condemnation. The plaintiff maintained that he was induced by the advertisement to spend a large sum of money in preparing a tender and to send it to the corporation. His price was 49,860l., and it was the lowest tender which complied with the conditions of the advertisement issued. Mr. Krauss complains that the corporation knew he was competent to execute the works, but notwithstanding this they accepted the tender of Mr. Walker for 54,543l. 19s. 4d. The plaintiff now claims to have re-paid him what he had expended in the preparation of his tender, and he demands 1000l.

#### REDRUTH MINERS' HOSPITAL.

The annual meeting of this institution was held on Monday. Mr. THOMAS HUTCHINSON presided. There were present:—Messrs. Frank Hitchens, Carlyon, Permewan, Harris, and Butlin, medical officers of the hospital; the Rev. Mr. Darnell, and Messrs. Walter Pike, Pearce, Jenkin, Leggo, James Wickett, Tom Moore, Wilson, and Charles Tweedy, secretary.

The report of the committee stated that there had been an increase in the number of patients during the year, and while they last year reported only 17 who were other than miners had availed themselves of the benefits of that hospital, this year 27 had thus availed themselves of the opportunity. The patients admitted had been 217, an increase of 10 on 1883, and of 55 in 1882. The total cost of maintenance had been 1400l. 2s. 4d., an increase on 1883 of 42l. 14s. 5d. They had paid Lord Robartes 622l. 15s. 9d., or 106l. 10s. 5d. more than in 1883, leaving a balance of 777l. 6s. 7d. to be met by his lordship, or 63l. 15s. 2d. less than he had to pay in 1883. The committee suggested to Lord Robartes that as the expenses of the hospital had increased from the more extensive use of its benefits, it was only right that the subscribers should pay a heavier contribution than hitherto, and it was arranged that in convalescent cases the contribution should be 11s., and in accident cases 13s. 6d. per week. During the year 199 patients were discharged from the hospital, after an average stay of 37 days. In 1883 the stay was an average of 42 days. Of these 149 left to resume work, 40 were discharged benefited, three left without benefit, and seven died at and were buried from the hospital. The total cost per bed for patients for the year had been 63l. 12s. 10d., as compared with 64l. 12s. 8d. in 1883. The average cost of food alone had been 30l. 16s. 7d. per head for the year, or 11s. 10d. per week, as compared with 10s. 11d. in 1883. The committee thought it right to remind subscribers that they (the committee) had no control over the expenditure, having only to pay the stipulated sum per week. No patients were now charged to Lord Robartes, all being admitted and paid for by the committee as far as the weekly contributions would go. They would find from the treasurer's statement that the total income, deducting legacies, had been 418l. 1s. 7d., made up as follows:—Subscriptions, 337l. 6s. 6d.; contributions of miners at South Condurrow, Wheal Grenville, Wheal Rassat, Pedn-an-drea, and East Pool, 101l.; Hospital Sunday collections, 136l. 11s. 5d., being again an increase over 1883 of 132l. 2s. 4d., and over 1882 of 113l. 15s.; and sundry small accounts. The treasurer had received from the executors of the late Mrs. Williams, of Caerhays Castle, a legacy of 1000l.; from the executors of the late Mrs. Tabb, of Redruth, 25l.; from the executors of the late Mr. J. G. White, of Camborne, 45l. The total expenditure had been 656l. 13s. 8d., a sum which exceeded the income excluding legacies, by 8l. 15s. 1d. They recommended that steps be taken for the investment of the 1400l., the surplus capital of the hospital.

The report of the committee and the statement of the treasurer were adopted.

The SECRETARY stated that of the patients 159 had been convalescent and 42 accident cases.

It was urged that the expenses for eatables were larger than was to have been expected.

Mr. PERMEWAN thought this particular expenditure had an injurious effect on the subscriptions.

The SECRETARY believed there were people who would rather that Lord Robartes paid than they would contribute anything.

Mr. BUTLIN observed that if comparisons were to be made as to the expenses of hospitals they should take a hospital where, like in their own, there were convalescent and accident cases.

Mr. PERMEWAN thought that many of the men who came there should do a little work. He condemned the practice of some of the patients loitering about the town during the day smoking. These men could at least do whitewashing and painting, and work in the garden, in that way lessening expenditure.

Mr. PEARSE JENKINS remarked that they tried the latter mode once, and the gardener said he preferred their room to their company. Now the garden-gate was locked, and the men could not, as on that occasion, carry off vegetables.

On the motion of Mr. WICKETT and Mr. MOORE, a vote of thanks was accorded to Lord Robartes for continuing the maintenance of the institution.

Votes of thanks were passed to ministers of religion for the collections made, to the treasurer, secretary, and auditor, to the medical officer, and to the Chairman.

A small committee, consisting of Messrs. Haye, Leggo, Pearce, Jenkin, Tweedy, Wickett, and Thomas Pryor, was appointed to consider the appointment of trustees to the disposal of the 1400l., the surplus money of the hospital. It was pointed out that the institution might at any time be stopped, as everything depended on the action of Lord Robartes. The opinion was expressed that Lord Robartes would not adopt such a course, but there was the probability that the future Lord Robartes might not follow the practice of the present nobleman.

#### MEETING OF NUT AND BOLT MAKERS.

On Tuesday night a numerously-attended meeting of nut and bolt makers was held at the Castle Inn, Cranford-street, Smethwick, Birmingham (Mr. F. Renny presiding). The Chairman remarked that he hoped they had met in the same spirit as they had met last time, and that the agitation commenced. He believed the branches were getting stronger every day, and they intended winning the battle they were engaged in. They had fetched the men out of the principal places where the masters were not connected with the Association. They had one obstacle in their way, there being one place at Darlaston where the men were a little reluctant to come out, but he hoped that by using a little persuasion and moral force they would get those men on their side, and if this could be accomplished the victory would be theirs. He urged that the men should be prepared to raise the levies, and pay the men who were fetched out a fair amount of strike pay.—Mr. R. Bowker and Mr. J. Richards having spoken, Mr. R. Juggins addressed the meeting. He observed that he had taken the opinion of the leading trade officials throughout the country as to the movement in which they were engaged, and announced the receipt of letters from Councillor Eli Bloor, Mr. E. Lilly (of the Brassworkers' Association), and Councillor Allan Granger (President of the Birmingham Trades Council), all of whom expressed approval and sympathy with them in the struggle they were engaged in. Mr. Juggins added that he was receiving letters constantly from the iron, coal, and other trade organisations, stating that the movement was being watched with anxiety, and that they were wishing it to succeed. Having taken the matter in hand, should they go back? Were they to beat a retreat? They must now settle the matter once and for ever on a basis upon which the employers and employed could shake hands and settle their grievances, and thus put an end to the cursed system of strikes and lock-outs. He hoped before another month had elapsed to be able to announce that they had accomplished their object. On the motion of Mr. R. Bowker, seconded by Mr. T. Poyser, a resolution was passed instructing the Executive Committee to convene a meeting of the men now at work for a non-association firm, with a view of either getting the men to give notice, or the firm to join the Employers' Association.

OBITUARY.—We record with regret the death of Mr. JOHN HAIGH, of Dewsbury, for many years a member of the Town Council of that borough, and Mayor in the official year 1878-9. The deceased gentleman was a colliery proprietor, being associated with his brother in the well-known firm of G. and J. Haigh. In politics he was a Conservative, and in religion a Churchman; but his views were not extreme. Some years ago Mr. Haigh was placed on the Commission of the Peace for the borough, and yesterday at the sitting of the Borough Court feeling reference was made to his death, the speakers being Mr. M. Newsome, J.P., an old friend and companion of the deceased, Ald. T. B. Fox, the Mayor, and Mr. Joseph Watts and Mr. T. L. Chadwick, solicitors. He was about 65 years of age. The cause of death was jaundice, supervening on cancer of the liver. Mr. Haigh leaves a widow, but no children.



## THE SPANISH GOLD FIELDS AND MINES OF RIO SIL.

At the meeting of the Foreign and Colonial Section of the Society of Arts, on Tuesday evening last—Mr. HYDE CLARKE in the chair—Mr. WILLIAM SOWERBY, F.G.S., M.I.C.E., read the following interesting paper on this subject:—

**Introductory Remarks.**—In order the more fully and completely to make manifest the importance and value of these mineral deposits, it is first necessary to describe the topography and extent of the country, and to indicate its lithological characteristics. The want of full information of this kind has too often been the cause of failure in the practical and profitable working, not only of gold mines, but of every other sort of mining adventure, for without such knowledge it is impossible to lay down plans for properly managing them. In the absence of any complete official Government surveys, which require years for preparation, the following description must only be considered as an approximate and general outline of these vast auriferous regions; it is, however, hoped that the paper will answer some practical purpose for preliminary investigation, and that it will help on further explorations. In order to lay down working plans for developing the mines, accurate and carefully prepared details are essentially necessary to make reliable estimates. Sufficient has, nevertheless, been done to enable any expert of long experience on such works to form a judgment, and to give a very decided opinion upon the promise and value of the mines. In this paper, the various salient points will be indicated, and the most likely places to commence working; also the probable results.

**Situation of the Mines.**—These auriferous deposits are found in an extensive succession of undulating hills. Mountains, valleys, and plains, stretching from the southern slopes of the western part of the Pyrenees, locally called the Cantabrian, Asturian, and Santillanes Cordilleras, in the provinces of Leon, Galicia, and Asturias, in the north, and extending to the confines of the province of Valladolid and of Portugal in the south, or from north lat.  $42^{\circ} 10'$  to lat.  $42^{\circ} 60'$ , equal to 50 miles, and from the Rio Esla (a tributary of the Douro) on the east to the Rio Minho (or Mino) on the west; or, say, from long. (west)  $5^{\circ} 40'$  to long.  $7^{\circ} 20'$ , equal to 100 miles, or a region constituting from 4000 to 5000 (geographical) square miles. It is not to be supposed, or assumed, that the whole of this vast region is equally auriferous; but there are so many well-known points where gold has been found, that it is quite justifiable to consider the extent of country above stated to be more or less auriferous throughout, and very many parts of it to be exceedingly rich.

**Topographical and Lithological Description of the Gold Region.**—On leaving the railway station at Palencia (on the line from Madrid to Santander), where the surrounding hills are limestone and limestone shales (one conical-shaped hill surrounded by a monastery being conspicuous close to the station), and travelling in a north-westerly direction towards Leon, the country is a wide, undulating plain, on which enormously rich crops of grain are grown; this plain is alluvial, and gives the impression that it has been, at no distant geological period, an inland lake or sea. This peculiar characteristic of the country continues up to and beyond the River Esla, and on to the old city of Leon. Gold has been washed out of the Rio Bomesga, which passes through the city of Leon; the Bomesga is a tributary of the Esla and Douro; the distance from Palencia is about 70 geographical miles. Beyond Leon, continuing westward towards Astorga, a range of low hills intervenes, and then there is another series of undulating low hills (chiefly schistose and alluvial), which occur for a distance of 40 geographical miles, until a very high range is reached at Braneulas. This range runs nearly north and south; the height is about 3500 to 4000 ft. above the sea, as measured by barometer. This ridge is the water-shed, and divides the drainage area of the Rio Douro from that of the Rio Minho, with their numerous tributaries. The tributaries of the Rio Minho are the Rio Boeza, the Rio Sil, the Burba, the Cabrera, and the Quiroga; the Minho empties itself into the sea at La Guardia. The drainage area of the Rio Douro also includes many tributaries—the Esla, the Duerna, the Eria, &c. It empties itself into the sea at Oporto. The distance from Leon to the top of this primary dividing ridge is about 50 geographical miles, and within this area are the rich alluvial beds of Astorga. On the highest points near to Braneulas there are extensive and deep beds of gravel, but much of these is, however, unworkable, owing to the elevation above all neighbouring streams. This mountain range is partly dioritic, and partly granitic, these primary rocks having obtruded through and disturbed the schistose rocks. Beyond this ridge the valley of the Rio Boeza and its tributaries begins. This river is a large one, and it finally joins the Rio Sil at Ponferrada. Beyond the ancient city of Ponferrada are Villafranca, Las Medulas, El Barco, Valdeorras (or the Valley of Gold), Domingo Flores, Montefurado, San Clodio, and Quiroga; this embraces a distance of about 70 geographical miles from east to west. Besides the Rio Sil and Boeza there are the Burba, the Cabrera, the Quiroga, and many other minor mountain streams, which are tributaries of the Sil and the Minho. The whole of this district, embracing the Boeza, the Sil, the Burba, the Cabrera, and the Quiroga, is very hilly, rising to a considerable elevation in some parts it is a mountainous country, rising to a height of from 3500 to 4000 ft. and upwards. In many parts the ground is much broken and disrupted, especially around Braneulas, Ponferrada, Domingo Flores, and Las Medulas, which latter place lies between the Sil and the Cabrera; this is where some of the richest and most extensive gold deposits are found; and again in the region from El Barco, Montefurado, and San Clodio, between which points the granitic rocks once more occur. There also the schistose hills are more abrupt. Wherever the mountains are high the valley of the Sil becomes narrower, and the adjacent rocks more precipitous.

**Communications.**—Access to and through this region is now easily obtained by means of excellent "royal roads," which traverse the whole country from Palencia, and other places, via Leon, Ponferrada, Domingo Flores, Puente Nuéve, El Barco, and Rua, on to Orense, and so on to the west coast of Spain, at Vigo, and of Portugal, at Oporto. There is also a road, via Ponferrada and Villafranca, to Corunna. These roads pass through the whole length of the auriferous territory, and are well maintained high post roads; but a line of railway has been recently opened right through the country to the ports on the western and the northern coasts, and this railway intersects the mineral deposits in the most complete manner possible. Where the line cuts through beds of gravel it has been thrown up as embankments, or used as ballast; veins of quartz have been exposed and intersected by tunnels, &c., and parapet walls have been built of the gold-bearing rocks, the gravel and rocks being highly auriferous.

**Lakes.**—One of the peculiarities of the country is the existence of a number of natural lakes. These lakes, or "tarns," are like many similar mountain lakes in England, Scotland, Wales, and India. They are situated at a very high elevation, mostly at the base of some prominent mountain peak, and near the sources of the mountain streams, as the Lago de Bana, at the head of the Rio Cabrera, also the lake at Filieil, near the Astorga gold fields. These lakes are generally fed to a large extent by springs of water rising in the mountains.

**The Geological Formation of the Country.**—In the absence of any regular survey this can be only very imperfectly described. Commencing at Palencia, the vast alluvial area has been already partly delineated at the outset of the paper. These plains continue, as already stated, up to the mountain range which forms the watershed of the Douro and its tributaries on the one side, and of the Minho and its affluents on the other. The range of hills westward of Leon is chiefly composed of schistose rocks of the Silurian type. Wherever the bed rock is exposed up to and beyond Astorga, and onward towards the high range at Braneulas, this bed rock is schistose. On the flanks or slopes of these schistose rocks lie the alluvial beds of gravel, in which are found traces and "flakes" or "pepetas" of gold more or less rich; at some parts the gravel is very rich in gold. This is particularly the case about 12 miles to the south of Astorga, in a broad valley through which flows the Rio Duerna, a tributary of the Esla and Douro. In the schistose rocks there are many veins of quartz which are known, by testing, to be

auriferous, but visible gold is seldom seen in the quartz, though the veins at the outcrop look very promising, and yield gold on assay to the extent of about 2 dwts. per ton. In the high dividing range of the mountains, trap or dioritic rocks protrude, causing great dislocation and distortion, and lower down are found granitic rocks of a grey colour, which in some places have a stratified appearance like gneiss. Beyond this range the hills slope very rapidly towards the River Boeza, and the Rio Sil, at Ponferrada. Immediately after passing the summit level of 3500 ft., the schistose rocks become prominent, and on the flanks of those schists, and in valleys, rest the alluvial gravels as before described. In these schistose rocks, besides small veins, there are many large lodes, and on the top of these lodes also above the gravel beds, there are masses of hard conglomerate; these lodes and conglomerates yield gold, and they appear to have been extensively worked in numerous places, as shown by old galleries. The gravel beds are all composed of detritus from the neighbouring hills—quartz in more or less quantity, boulders mostly of quartz and schist with some trap, and also magnetic iron ore; and wherever the quartz and iron are most abundant there the gravel is invariably richest in gold—in fact, without the quartz and magnetic iron, there is no appreciable quantity of gold. At and near the confluence of the various streams, the gravel beds are exceptionally rich and well defined—this is especially the case where the Boeza joins the Sil near to Ponferrada; these deposits occur just beyond the point where the granitic rocks have penetrated the schists. The washings from these gravel beds gave 2 dwts. of gold per ton of stuff, and were even richer near the bed rocks. The City of Ponferrada is a very ancient town; it is situated on high ground, where there the Boeza and Sil join each other, and it may be called the very centre of the great gold region; it is surrounded by moderately high hills, and the gold basin can be easily traced by the ferruginous red colour of the ground. The basin continues not only in a directly westward course along the valley of the Sil, and in the adjacent plains, but also in a north and north-westerly direction beyond Villafranca and the Rio Burba, where extensive deposits are known to exist, and have been extensively worked; around Ponferrada the old workings have been considerable, and at this point some ancient Roman cupolas for smelting the gold have been found. Following the valley of the Rio Sil westward, immediately after leaving Ponferrada, there is an extensive plain, which, on being tested, invariably yielded gold in each "batea" or pan; this plain is partly under poor cultivation, being nothing but gravel and boulders with a little soil; the high road and the railway both cross this plain, the road is carried over the river by a costly new iron bridge. Beyond this bridge, a few miles along the high road, are the ruins of an ancient castle, said to have been built by the Romans during the period of their occupation, and restored by the Knights Templars of more recent times. The geology of the hills around is the invariable schistose wherever the bed rock is visible, with the same alluvial deposits on the banks of the river, and on the flanks of the hills; some of these alluvial beds rise up in abrupt "scars" by the side of the River Sil; and wherever small streams join the main river these alluvials appear to have been worked. The country along the valley continues to be of the same schistose and alluvial character throughout, until the Lake of Carucedo is reached; the high road passes this lake within 50 yards or less. It is believed to be a natural lake, and it is about 300 ft. above the Rio Sil, but it is separated from that river by a low mountain range; behind and above this lake there appears to have been formerly other lakes up the valley towards Borranes; these latter have, however, dried up and been drained, and partly cultivated and reclaimed. Beyond this lake going westward there is an abrupt change in the geological formation; large hills of mountain limestone rise upon the side of the Rio Sil, and to the south of the lake there is a very extensive auriferous gravel bed of about  $\frac{1}{2}$  mile wide, and higher up the hills, in the same direction, are the ancient mines of Las Medulas, which are of gravel, lying on the flanks of the schistose rocks as usual. This sub range rises up to about 1700 ft. above Lake Carucedo, and about 2000 ft. above the Rio Sil. The Las Medulas gravel deposits are conspicuous from the high road at Carucedo, there being many lofty and fantastic peaks and pinnacles rising to an elevation above the adjacent ground of from 400 ft. to 850 ft., with an unbroken face or "scar," which has been made artificially by the denudation works of the old miners, for the purpose of extracting the gold from the gravel. Leaving Las Medulas, and passing through the limestone range with its abrupt peaks, and travelling westward, the village of Salas is passed; this village is on the banks of the Sil river. Here the schistose rocks again appear in the red gravelly alluvials, on the hill sides, and at their base; but they do not rise to the same elevation as those of Las Medulas, which latter seem to be the culminating point of an immense ancient geological basin, or river-bed; both the depth of the gravel, and the extent of the deposit being the greatest at that point, which has been elevated at a remote geological epoch by some powerful upheaving influence, to its present conspicuous and remarkably singular position: these deposits will be further discussed hereafter in this paper. Continuing down the valley of the Sil (along the left bank of which is the royal high road, while on the opposite bank is the new line of railway), in many parts of the river there are dry patches of auriferous sand and river boulders, and wherever the bed rocks are seen, they enclose numerous veins and lodes of auriferous quartz, which have been penetrated by galleries and worked at many points.

At Domingo Flores the River Cabrera joins the Rio Sil. The rocks continue to be the same, but at this point, and more particularly on a hill just opposite the village, at a place called Querano, the gravel assumes the more hard character of conglomerate. The boulders, pebbles, gravel, sand, &c., are cemented together with a hard ferruginous kind of cement, composed chiefly of a little clay, with fine grains of quartz and sufficient iron to tinge the stuff a deep red colour, and the whole is thus formed into a solid hard mass, but in other respects the bed resembles the ordinary gravel beds, only redder and more hard; the hardness appears to be due to exposure. Extensive deposits of this conglomerate are found again and again all the way along the valleys of the Rio Sil and its tributaries, as far as Montefurado and San Clodio; in some places huge blocks, many tons in weight, are lying on the surface; at other places there are extensive beds exposed by denudation, either in the rivers or on the sides of the hills. The large blocks are however found to be overlying the schistose rocks, and sometimes, as at El Barco, they are above the gravel beds on the same hill side. The granitic and trap rocks appear to form the chief rocks of all the higher ranges, and the Rio Sil and the Boeza cut through a range of these rocks above Ponferrada; and again at a short distance beyond Rua on the road to Orense, where the valley becomes very narrow and the hills on each side very precipitous, the granite rocks are found cropping out. Beyond this point, up to Montefurado, the schistose and clay slate rocks again abut on the river, and there are very many veins and lodes of quartz visible in these schists. The schistose rocks nearly always lie at a very abrupt inclination with the horizontal plane, and they usually dip with an angle of  $75^{\circ}$  to  $80^{\circ}$ , and the strike is nearly east and west.

The River Sil takes its rise in the mountain regions to the north, and its course is like all mountain streams very circuitous, and mostly very rapid, having a slope or gradient of from 50 to 60 ft. per mile, and in some parts 150 ft., or from 1 to 3 per cent.; while its tributaries, such as the Boeza, Burba, Cabrera, Quiroga, &c., have a still greater gradient, in some parts of its course, as below Ponferrada, the valley and river widen out to a great breadth; this occurs again, only in a less marked degree, at Salas and Domingo Flores, also at El Barco and Rua, as well as at Montefurado and San Clodio; while at other places—near Carucedo, Puente Nuéve, and beyond Rua, the valley is narrow, and the sides of the river are somewhat precipitous and abrupt; generally, however, the river is deep below its banks, except at the places above mentioned. At various parts along the course of the different streams the beds give a somewhat horse-shoe shape; this is the case near to Carucedo, the village itself is, however, 2 miles away from the Sil, in a valley running parallel to that valley, in which valley the lake before mentioned is situated. These beds have been taken advantage of for laying dry the beds of

the river at certain seasons, and washing the gold out of the sand and gravel. There are many points, too, along the course of the river's bed, which are periodically flooded, and which, when dry, are washed for the gold brought down out of the hill sides, and arrested at its course; some of the pools also contain much gold left by the passing floods. The geology of this extensive region, which contains gold, resembles in most particulars similar gold regions in other parts of the world, especially those in California and Columbia; they are very extensive in point of area, but the gravel beds, perhaps, surpass in depth and height anything of the kind in the known world: 850 ft. of gravel (as it is at Las Medulas) is, it is believed, in thickness beyond any other known similar deposit of gold gravel in any other part of the world.

The Mines.—Commencing from the eastward, the first group are those in the district near to Astorga; which is a very ancient city, and it is built on an elevated bed of auriferous gravel; and travelling southward from that city the country is one continued series of undulating low hills and valleys composed of schistose rocks, with gravel beds resting on the slopes of the hills and in the valleys, and with quartz veins running through the schists, the surface being covered with boulders and fragments of quartz. The gravel is composed of smaller pieces of quartz, schist, and ironstone, and this continues until the River Duerna is reached, a distance of about 12 miles from Astorga. The banks of the Duerna rise to a height of from 100 to 150 ft. on the left side (the river flowing eastwards), and these banks are composed of a reddish yellow gravel with boulders and fragments of quartz, and a matrix of yellow clay; this gravel gives visible gold on being washed, every pan of stuff that was washed gave one, two, or more small "pepetas" or "colours" of gold; this is at and near the village of Pierenza. Higher, upon the left bank of the River Duerna, near the village of Luiego, there are the remains of an extensive ancient reservoir for water, and immediately below that point there have been very large washings of the hill sides. The bed rock is, in some places, very near the surface, and there is, consequently, but a thin covering of gravel at other points; however, the gravel is of great depth and thickness, as shown very clearly by the old workings, which have but very partially cleared away the immense deposit, representing the appearance of one of these huge banks from the opposite side of the river. The thicker beds of red gravel recede some little distance from the present course of the stream, the intervening space being gravel and large boulders of quartzite, &c.; the gravel beds rise to an elevation of from 80 to 150 ft. and upwards. Along the whole course of these gravel beds, from the village of Pierenza, for a distance of several kilometres (probably 12 miles), there are found the remains of ancient workings to an enormous extent, as shown by the numerous waterways (sluices) leading from the gravel beds to the river, which occur at intervals of every 100 yards or less; and on following up the courses of the small streams coming from the hills on the south, there are the remains of extensive hydraulic washings, with canals, reservoirs, and all the needful works for extracting gold on a very large scale, while the heaps of boulders show that thousands of tons have been removed and washed. The water was partially brought from a small mountain lake (still in existence), about 3 kilometres (2 miles) from the mines, and the remains of the old canals still exist. Great as have been the workings of the ancient miners, they have done but little to exhaust the immense deposits of gravel, which apparently extended at this place for a distance of 25 to 30 miles in length, and about 2 or 3 miles or more in width; this is, of course, a very general estimate of the extent of the auriferous ground, but there can be no doubt that sufficient workable mineral is still available for works on the largest scale for many years to come—in fact, a generation or two will not exhaust the deposits. The extent of the works will, however, have to be limited by the supply of water. The small tributaries of the Duerna and the canal appeared, when visited, to yield about 15 cubic feet of water per second—that is, about 20 ft. wide, 1 ft. deep, and flowing at the rate of about 9 in. per second. This would be equal to about 400 to 500 miners' inches (assuming 1232 gallons or 189 cubic feet to be equal to 100 miners' inches); but the large river, Duerna, would be equal, perhaps, to 1000 miners' inches if the whole of the stream could be made available, and, with such a supply, 60,000 to 100,000 tons could be washed per month. A portion of the water only is now used for irrigating purposes in the fields on the low grounds. This need not, however, be interfered with—indeed, the supply of water might be increased for such purpose if the works were carefully laid out, and the double object kept in view. The assays which have been made of these gravel beds need not be accepted as strictly accurate data upon which to base any calculations. These, however, have given as much as 10 grammes (French) of gold per cubic metre, and an assay gave as much as 9 dwts. per cubic metre. These assays were made after the rough boulders had been extracted, and these stones would form about 75 per cent., in bulk, of the whole gravel bed, so that a true proportion would be from  $2\frac{1}{2}$  grammes (French) to  $2\frac{1}{2}$  dwts. (English) per cubic metre, or, say, about 1 gramme per ton, the gramme being worth 2s. 6d., so that if the cost of reduction, sluicing, &c., be 6d. per ton (which is an excessive rate), the net yield per ton would be 2s., which, on 100,000 tons per month, would be 10,000*l*. This is a question which must, however, be much more carefully discussed when the exact works are finally determined upon, and fuller information as to the water supply, and the productiveness of the gravel beds have been more accurately ascertained. There can, however, be no doubt that the deposits on and near the Duerna river offer most favourable facilities for the commencement of the works of washing on a moderate scale, and of extending the same when they are found to yield profitable results. There are three rivers in this locality—the Duerna, the Orvigo, and the Eria, which are tributaries of the Esla and Douro, and rise under Mont Teleno, on the eastern side of the same mountain range in which the River Cabrera, a tributary of the Rio Sil, rises. These rivers, the Duerna, Orvigo, and Eria, drain an area of from 500 to 600 square miles, and there is a large lake in the district which is also available. Should the water from these rivers not be sufficient, then it is possible to increase the supply by large reservoirs, as is done in America and elsewhere; but the probability is that there would be sufficient water in the Duerna itself to meet all requirements. Besides these gravel deposits on the Duerna river, there are many other places in the Astorga district where auriferous beds are found, being conspicuous by their red colour and peculiar appearance at a distance all round the country, many of them having been largely worked.

The Boeza Valley.—Along the whole of this valley there is an immense extent of auriferous gravel beds, especially near and around Bembebre. The beds commence immediately beyond the ridge at Braneulas, and in many places there are old workings; but the richest place is near the junction of the Boeza with the Sil. The valley here is broad, and the beds well exposed, and they are of considerable thickness.

The Las Medulas.—The group of mines at and around Las Medulas are of great extent, and they have been worked on a stupendous scale in ancient times, as is clearly shown by the debris from the washings, which covers many thousands of acres. These mines are first noticeable from the high road at and near the village of Carucedo, the red gravel peaks rising up on the south to a great height, perhaps 1700 ft., and being conspicuous because of their peculiar and fantastical pyramids and pinnacles, which are visible at a great distance. The exact extent which these gravel beds occupy in length and width cannot be very well defined. They are found by the banks of the Boeza, the Sil, and on the Burba, and again on the Cabrera, and they extend from beyond Ponferrada on the east, up to and beyond Domingo Flores on the west, with an area of about 1250 square miles, being 25 miles from north to south, and 50 miles from east to west. The true character of the deposits is easily and clearly ascertained, not only at the various points where they have been upheaved and exposed, or laid bare by the action of denudation, in the Boeza, the Sil, the Burba, the Cabrera, and their tributaries and branches, but also from the fact that they have been worked on such an extensive scale that there can be no doubt as to their immense area, nor any difficulty in ascertaining their true character and value. The deposits in the Medulas district differ but little



from those at Astorga, except, perhaps, from the works having been on a more stupendous scale, more gigantic in quantity and more disturbed by upheavals, while, from the appearance of the gravel, and its general character, the quality does not materially differ.

The bed rock, or base rock, of schist, is of a bluish grey colour, and not very compact, but loose and friable, especially where it is exposed and weathered. These schistose rocks form the series of hills which run in a southerly direction from the main sierra, or mountain range of the Pyrenees in Galicia and Asturias, and the country takes the form of a complete basin, extending from San Clodio and Quiroga, Montefurado and El Buroo, on the west, to Ponferrada and Brannelas on the east, a distance of about 60 geographical miles, by about 40 miles wide.

This area includes several subsidiary basins, which further explorations will more clearly define. Low down in the valleys, especially near the Sil, Boeza, &c., are found beds where the gravel is coarse, and comparatively clean; further up the gravel becomes less coarse and more red in colour, and a little clayey, or argillaceous; then, still further up, these beds become still more clayey, and less free, as at Las Medulas, which is the highest point, and there the strata is intersected by bands of bluish-white clay, which runs in regular seams, alternating with small gravel beds of schist, quartz pebbles, and ironstone. The entire thickness of these gravel beds from the lowest point near the Boeza and Sil to the highest point at Las Medulas or Brannelas cannot be far short of 2000 ft.; this, it must be remembered, is not in one continuous stratum, but a succession of steps, each differing slightly in character, but all containing alluvial gold; while in the underlying schistose rocks are numerous veins or lodes of auriferous quartz, which are evidently the parent source of the golden gravel covering so extensive an area of country; and there can be but little doubt that in the higher regions of Galicia, Asturias, and Leon, there are other gold-bearing quartz rocks which, in time, will become known and worked—in fact, the existence of these gold rocks is already known, and some of them, like other gold reefs, have been worked in ancient times. In the mountains to the north of San Clodio, where the Quiroga river rises, there is a reef of quartz which traverses the country for many miles in an east and westerly direction, and which contains gold, silver, and tellurium, similar to the rich tellurides in Colorado.

The working of the mines at Las Medulas appears to have been on as vast a scale as are similar works in modern times, through the instrumentality of water brought over the mountains at the source of the Cabrera; the water was brought on to the face of the gravel beds for a distance of 50 miles, and there collected in reservoirs, then allowed to flow over a vertical fall of from 400 to 800 ft. in height. The waters were evidently used in the first instance for denuding the lower hills near to Carucedo down to the bed rock of schist, and the work gradually receded backwards until the immense quarry hole of Las Medulas was excavated, having a vertical face of 800 ft. from the base to the summit, and there are many pinnacles of gravel left standing isolated in a huge amphitheatre, because they could not be cut away, as they had no hydrants or monitors in those days. The exact mode of working has not, however, been explained, and the secret of recovering the gold is said to be a lost art, though the process is fully described by Pliny; a great number of slaves or prisoners of war were employed (some 60,000 according to Pliny). They were occupied in removing and piling up the boulders and debris which are now to be seen scattered over the country for many miles, covering thousands of acres. The water, after being used for breaking down the hills, flowed through several gorges, and into some small lakes or settling pools, which are still in existence, and then found its way to the large lake at Carucedo, and so on to the Rio Sil down a steep gorge between high banks of gravel and schistose rocks. The old canals are still traceable, and portions of them are in a complete state of preservation, so much so that they might be again utilised for the same purpose. The canal appears to have been divided into six or seven minor channels as it approached the Las Medulas, where it was allowed to flow over the gravel bank, though the breaking down of the bank was also probably partially affected by manual labour. That the works were on a vast scale is sufficiently clear, and that millions of tons were broken down and washed is also very certain; but there is nothing like an exhaustion of the deposits, the quantity remaining will last for generations.

The gravel of Las Medulas invariably yielded colours of gold on being washed, this continued from the very top to the point where the water flows down the gorge below Carucedo, and amongst the gravel occasionally are found small nuggets of 1 oz. in weight, picked up by the shepherds and labourers. This has occurred both at Las Medulas and in several other localities, but the largest grains of gold have been found in the gravel on the Boeza in the Cabrera, the Sil at El Buroo, and Quiroga. Usually, however, the gold is fine flower gold, and the finer it is the more plentiful it appears to be, but also the more difficult to secure. The waters of the River Sil are very plentiful, probably 10,000 miners' inches; there are seasons, however, when the rivers are unusually low, as in most countries, but as a rule they never become very low or dry, as they are fed by many mountain rivulets and springs, the snow frequently remaining on the tops of the mountains for months. At Domingo Flores the River Cabrera joins the River Sil, and near to that place there are numerous old galleries driven into the gravel and conglomerate beds, more especially at a point where the schist rocks and limestone formation come in contact where the gallery is of great extent. Along the whole course of the Cabrera itself the gravel has been always famous for its gold, and it has been obtained by simply washing the stuff taken from the river's bed in an ordinary "batea," or wooden bowl of conical shape, which will hold from 12 lbs. to 20 lbs. of earth and sand, the result being invariably several "petetas" of gold; and a day's washing will give from 5 to 10 petetas (from 4s. to 8s.), and seldom less than 3 petetas, or 2s. 6d. The conglomerate, which is very abundant in the neighbourhood of Domingo Flores, is said to be rich in gold and silver, varying from ½ oz. to 2½ ozs. per ton of stuff. It also contains many other metals, such as tellurium, iridium, silver, platinum, &c.; but the stuff is refractory, and will require careful and special treatment in its reduction. There is, however, ample water-power in the neighbourhood for putting up any kind of crushing mills, &c., for treating and smelting the mineral. Beyond Domingo Flores the valley of the Sil widens out into what is called the Valde-Ormas, and here commences those rich river washings which have given the name to the district. Here the old Roman and other ancient workings have been on a most extensive scale, as indicated by the heap of boulders piled up for many miles. The washings have, however, been mostly on low ground, close to the river, every reach, or horseshoe shaped bend, having been most skillfully laid bare and washed clean. Up to the present time, after every flood in the river, there is a fresh crop of gold in the sand, which is surcharged with grains of the precious metal. The natives annually take a spell at the gold washings, but only during a few weeks each year, such being the only time they can spare from their other occupations in the fields, which, being less precarious, are, therefore, more profitable. Lately these annual washings have been less, owing to the railway company affording regular employment during the construction of the works. At El Barco the auriferous gravel beds reach down and across the River Sil. The town is built upon gold gravel, and these beds go up the hill sides to the village of Castro, the beds being 40 to 60 ft. in thickness; at the lower part of the valley there are, however, 4 to 5 ft. of top soil, which is partly cultivated, and the hill slopes are covered with vines; wherever the gravel was tested it yielded very good colours of gold. One small stream, which flows through El Barco, is known to yield large quantities of gold and is annually washed, like the Cabrera, and other streams, with profitable results. Beyond El Barco, towards Ron, the gravel beds are continuous, from the river's bed to far up the hill sides, to where the bedrock crops up, and beyond that place (Ron) the valley narrows, and the granite appears running right across the country. These granites continue from some distance towards Montefurado, where the schists again occur, with the usual gravel beds, which have been partially worked.

At Montefurado there is an extraordinary work of the old miners.

The ancient bed of the River Sil passed round a long, rocky promontory of schist, shaped like a neat's tongue, the river's bed describing an elongated, horseshoe shape. At the narrowest point a tunnel has been cut through the hill, and by this means a long stretch of the river was laid bare and washed for gold. The scour of the river over the soft schist has gradually deepened it, until it is 10 to 15 ft. in depth, and the stream now flows at a level considerably below its former course; but it occasionally rises, during floods and passes, along the old waterway, and the sand when dry is again washed for gold, with good results; but the gold is extremely fine and flowery, showing that it has travelled a long distance. Beyond Montefurado, towards Lugo and Corunna, down the Sil Valley, the same schistose formation exists until the river joins the main stream, the Minho, and at several points along the course of the stream, there are a succession of gravel deposits and some old workings. This is especially the case at the small tributary called the Quiroga, a stream of about the same size and character as the Cabrera; this river joins the Sil near San Clodio, a station on the railway. At this place the gravel beds are very deep and rich (60 to 120 ft.), giving visible coarse gold in every pan washed. There are at this place very extensive remains of old workings on both sides of the river with galleries and watercourses, and there is still an immense field of virgin gravel remaining to be worked with ample water either from the Rio Sil or the Quiroga.

To attempt to estimate the value of these enormous gold deposits would be very vain, their extent is so vast while their richness is unquestionable. The Romans are said to have obtained 20,000 lbs. weight of gold annually from these mines (*vide Pliny*); this would be nearly 1,000,000l. sterling, and this was continued for about 300 years during the Roman occupation. To accomplish this they had 60,000 slaves and prisoners of war employed, and the country was, doubtless, then much of it in a state of Nature, with dense forests, and a correspondingly copious rainfall. But these old miners had none of our modern appliances. It would then be indeed strange if in modern times, with the best appliances possible, similar or even greater results could not be obtained; for there are the vast deposits still untouched, notwithstanding the immense amount of work that has been done, in addition to the masses of conglomerate and gold quartz which have also been but very partially worked. There is also abundance of water flowing through the valleys of this extraordinary country, and the forests, though not dense, as in the time of the Romans, are still ample for all mining purposes; in fact, some of the oak forests are of very great extent and value. Besides the valleys of the Rio Sil, Boeza, and other streams, which have been more fully described in this paper, there are other streams on the north of the Pyrenees, such as the Navia, &c., where gold exists, and where old washings are found. There are also many other minerals, such as coal, iron, galena, copper, tin, antimony, and cobalt, found in the district, while in the rivers to the south, in Portugal, gold is known to exist; but much time must be required before all these can be known and explored. To commence works anew will require the utmost care and skill, but if once success should be obtained and assured with a moderate outlay of capital, then confidence will be established for developing the mines on as large a scale as possible, and it should be remembered that these valuable gold mines are not in the centre of tropical Africa, or India, or thousands of miles distant, as in Colombia, California, or Australia, but only three days distant from London, and two days from Paris, a great advantage where good management has to be considered, on which so much of the success of all mining depends.

#### AKANKOO (GOLD COAST) MINING COMPANY (LIMITED).

The following statement is issued:—The shareholders will, no doubt, be anxiously awaiting news from the mine since the arrival of Mr. Harvey. That gentleman arrived at the mine on Jan. 4, and his latest dates are Jan. 20, consequently sufficient time had not elapsed for any important works to be undertaken. Nevertheless the news which has just been received from him is satisfactory, and the directors forward extracts of the principal portions of the letters and reports received, containing the latest information regarding the mine, which they are glad to find is of an encouraging nature. The directors regret that, owing to the piston, &c., of the engine having again been broken at the mine, operations were stopped for several weeks until the new piston, &c., which had been sent from England by way of precaution had arrived; but at the date of the last advice all this had been made good, the mill was again in full work, and the new boiler which had been sent from England had arrived at the mine, and was in course of being erected. Meantime they have received advices from Mr. Louis, the reduction officer, under date Jan. 14, to the effect that they had been cleaning up, from which he expected to get 50 to 60 ozs. of gold, which would be sent home by an early mail. As the additional 10 heads of stamps were then in course of erection, and arrangements were in view for running the mill day and night, the directors now confidently look forward to large and steady shipments of gold from the mine. With a view to further economy in the London expenses, the offices of the company will be removed to Nos. 310 and 311, Mansion House-buildings, E.C., on and after Monday, March 2, and the directors have made other arrangements as to the staff, which will result in a total further annual saving being effected in London of 250l. per annum.

IMPROVEMENTS IN MACHINERY.—Messrs. THOS. HETHERINGTON AND CO., of Manchester, have just completed an order for the North-Eastern Railway Works, at York, consisting of a number of tyre boring lathes and wheel lathes, in which one or two special features have been introduced. In the tyre boring lathes, which are driven in the ordinary way by worm and worm wheel, a very handy arrangement has been introduced for moving the worm out of gear to facilitate the chucking of the tyres. In order to effect this the worm shaft is carried on two sliding blocks working on each side of the bed, and these blocks are moved by a cross shaft and links, coupled to levers on the main cross shaft. When the worm is in its working position the levers are down on their centre, thus locking the worm in position, and it is thrown out of gear by a cross handle in a convenient position on the side of the bed. The self-acting motion is self contained, and consists of a feed disc, rocking shaft, and quadrant pulley feeding both sides. Messrs. Hetherington have also in hand several large power travelling cranes, of 20 to 25 tons, in which improvements are being introduced. The whole of the working parts are of steel, and the gearing for rope driving and effecting the various motions is carried in a neat framework, consisting of two cast-iron sides braced together, in a much more compact form than in the usual arrangements. The crabs are also provided with an auxiliary barrel for doubling the speed for quick light lifts when required.

THE CARRIAGE OF DYNAMITE.—Mr. Richard C. Briscoe, owner and agent of the "Marquis," which had been used for the importation of 40 cases, representing 2000 lbs. of dynamite into the Mersey, was summoned to the Liverpool Police-court on Tuesday last for having neglected to produce the necessary license to the water bailiff of the river either before or immediately after the arrival of the vessel. From the evidence it appeared that on Feb. 5 the "Marquis" arrived in the Mersey from the Isle of Man, and anchored near Egremont. She was boarded by Inspector Egerton, who found the dynamite stored in the vessel, but ascertained that no license had been taken out by the owner, as required by the Explosives' Act of 1875. Mr. Carver, for the defence, stated that the defendant had acted in ignorance of the law in this matter. Mr. Carver added that the dynamite was on its way to the Vyrnwy Waterworks, where a ton of it was legitimately used almost every month. The Bench dismissed the case.

THE Trimdon Colliery, Durham, is flooded. The flooding commenced on Friday, and the miners escaped with difficulty.

THE Midland Railway Company have decided to issue weekly workmen's passes for use on their line.

#### THE TEMPERATURE AND MOISTURE OF AIR CURRENTS IN MINES.

A paper on this subject was read by Mr. A. R. SAWYER, Assistant Government Inspector of Mines, to the members of the North Staffordshire Mining Institute at their annual meeting, at Stoke-upon-Trent, on Monday evening. The writer stated—One of the most important subjects in connection with mines is the thermometrical and hygrometrical conditions of the workings. This is especially the case with regard to seams which from whatever cause are liable to spontaneous combustion. Good ventilation with a proper distribution of air besides diluting noxious gases tends to lower the temperature in unextended workings during the greater part of the year. It has a cooling effect on a warm gob up to a certain temperature, but acts on it injuriously once that temperature is surpassed. Mr. Fayol, who made experiments with small coal in the coal field of Commeny, ascertained the temperature to be between 140° and 212° Fahr., but it will differ in different districts and for different seams. At Great Fenton, in the Ash seam, gobs are not allowed to exceed a temperature of 80°; the diversion of more air into it always lowers the temperature very soon. At a colliery in which the Ragman Rough 7 feet and Hams are worked together it is the rule to build off any place in which the temperature reaches 90°, as on one occasion 92° having been registered in a place it was in flames the next day. At an adjoining colliery, in the same seam, 97° were registered in the gob two days before it was found to be on fire. Atmospheric moisture plays an important part in raising the temperature of some workings, especially in seams containing pyrites. I have endeavoured, as a first step towards a consideration of the subject of spontaneous combustion in mines, to establish some facts concerning the temperature and moisture of workings in summer and winter. An interval of about six months had necessarily to elapse between the two or three series of observations to get extreme temperatures; but the districts in which the observations were made did not alter materially during that time. Observations were made at different points along the air currents in intakes, workings returns, and in the gob. They were made as nearly as possible at the same points on each occasion. I have used Mason's wet bulb hygrometer, and determined the amount of vapour contained in a cubic foot of air by means of Glaisher's Table. Though not a very good way of determining the moisture of the air it was the only practicable one, as the method by weight of hygroscopic substances, though absolutely trustworthy, would have entailed too much time and trouble. The hygrometer was placed as nearly as possible equidistant from roof, sides, and floor. Observations were made at the following collieries at depths ranging from 370 to 971 yards. They were made as soon as possible after each other in the order in which they are recorded. Surface observations were on several occasions made after as well as before the underground ones, and the differences were of little practical importance:—

Colliery.	Seam.	Depth in yards of Shaft.	Deepest place of observations.
Beny Hill	Ash (Rowhurst)	440	440
Glebe	Moss	590	590
Great Fenton	Ash (Rowhurst)	595	595
Florence	Moss	738	738
Dukinfield	Black Mine	684	856
	Cannel Mine	684	971

These observations cannot be rightly estimated without a knowledge of—1. The nature of the seam.—2. The gob area of the district.—3. The quantity of air passing at the time.—4. The number of men, boys, and horses employed.—5. The depth of the points of observation from the surface. As to the first the Ash seam is the only one of these seams specially liable to spontaneous combustion, several gob fires having occurred in it in this district. The seams in which these observations were made are worked by longwall, and the points of observation were consequently not always in the full air current. This explains why the temperature is greater, and there is more moisture in some of the intermediate working places than in the return. The highest and lowest temperatures observed from the first working place to the return were:—In summer, 88° to 62°; in winter, 84½° to 62°. The greatest and smallest amount of moisture in a cubic foot of air from the first working place to the return was:—In summer, 11.1 grains to 3½; in winter, 9.55 grains to 3½. Differences of temperature on the surface were considerably reduced in the workings, but did not vanish altogether except at Great Fenton, but this was probably owing to an altered condition of the workings, and to the nature of the season. The observations made in Cannel Mine, at Dukinfield, give a good indication of the relation between the difference of temperature on the surface and underground, where a difference of 51½° produced a difference of only 2½° in the return at a depth of 907 yards. This shows how quickly and readily the air assumes the temperature of the surrounding strata which is, of course, independent of surface temperatures. The difference between the quantity of vapour in a cubic foot of air on the surface and in the return is greater, the lower the temperature is on the surface, as shown by the observations made in the Cannel Mine, at Dukinfield, where, with the thermometer at 32°, the difference was 5.3 grains, and with it at 83½ only 2.7 grains. This is what might be expected from the fact that the colder air is the less moisture it is likely to contain, and that its absorbing power for moisture, and consequently its drying power increases the hotter it becomes. It follows that on cold days dry and dusty mines are drier, and the dust more inflammable than on warm days. This is evidently one of the reasons why, when blasting was not restricted in fiery and dusty mines as it is now, explosions were more frequent in the winter than in the summer months, and their range greater. Several observations showed a greater temperature in unventilated places and gobs than in the air current close by. On diverting the air current from wastes in some seams the amount of vapour in the air increased after a few minutes, whilst the temperature remained pretty constant. This points to a slow combustion in the gob. An examination of the diagram shows that in all but one case, which was owing to special causes, the amount of air passing through the districts measured more the colder the temperature was at the surface, and that consequently the January returns of the quantity of air are the most favourable. The thermometrical and hygrometrical condition of workings in mines have also to be considered with a view to determine the possible depth at which coal may be worked. From the observations recorded it will be seen—1. That the time when workings will have reached the greatest workable depth is still remote.—2. That air under ordinary pressure or uncompressed will avail little towards increasing the workable depth in extensive workings owing to the air so readily assuming the temperature of the surrounding rock. The limit of workable depth will also, to a small extent, depend on the time during which men are exposed to the temperature, and to the amount of work they perform, and to their acclimatisation. This subject is also slightly connected with that of falls of roof and sides. The action of moisture on some strata is best understood when it is known that holing is facilitated by water being thrown into the holing dirt, and that this is pretty often resorted to when the holing dirt is very soft. In the same way atmospheric vapour may tend to loosen some roofs, and as the air contains more moisture the hotter it is, this action should be greatest in summer. But as the quantity of air, the ventilating arrangements, and the blasting regulations are now expected to be such as to deal effectively with the effects of sudden barometrical depressions and other causes, so is the timbering of roofs and sides.

COPPER QUEEN UNITED (Limited).—Letters of allotment and regret have been posted.

HOLLOWAY'S OINTMENT AND PILLS.—Sudden changes of temperature sorely try all persons prone to rheumatism, sciatica, the rheumatoid, and many similar maladies scarcely less painful, though of shorter duration. On the attack of stiffness or suffering in any muscle, joint, or nerve, recourse should immediately be had to fomenting the seat of the disease with hot brine and rubbing in this remarkable ointment, which will assuage the uneasiness of the part, subside inflammation, and reduce the swelling. The pills, simultaneously taken, will rectify constitutional disturbances and renew the strength. No remedy heretofore discovered has proved so effective as the ointment and pills for removing gouty, rheumatic, and scrofulous attacks, which afflict all ages, and are commonly called rheumatism.



## FOREIGN MINING AND METALLURGY.

Prices have continued to rule low in the French Iron Trade, and this must necessarily be the case, seeing that the demand has been much below the supply, while the works are still producing more than the country can absorb, and there is little doing upon export account. Under present circumstances, it is not at all surprising that competition has become inveterate, and that the price of steel rails has been run down by the French steelworks to a level which is simply ruinous. An order for 5000 tons of fish-plates is stated to have been given by the Western of France Railway Company to the house of Lelille, at Poissy, at 37. 6s. 6d. per ton. Some rather important orders are being booked for cranes and turntables for some of the other great French railways. A considerable order for armour-plates is also expected to be given by the French Government to the Naval Steelworks Company. The Paris, Lyons, and Mediterranean Railway Company is about to construct some large trucks for the conveyance of artillery material. The German iron trade has shown general feebleness. Pig has been in little demand, while iron of every description has been offered by the rolling-mills at very low rates. Plates also have been in little request. An order for 4000 tons of steel rails has been shared at Karlsruhe by M. de Wendel, of Hayange, and Herr Stumm, of Neunkirchen, at 71. 6s. per ton. The administration of the Swedish State Railways has just given an order for 2500 tons of steel rails to the Union of Dortmund.

The Belgian iron trade continues in a languishing and depressed state. Orders have continued to come to hand from day to day, but prices have remained low, and work can only be obtained by giving way at all points to the wishes and views of clients. Under these circumstances, any quotations which may be given are rather nominal than real. It may, nevertheless, be remarked that orders, although precarious, have not made default, and that upon the whole 1884, so far as exports were concerned, did not leave very much to be desired, although the prices obtained were far from satisfactory. The Belgian Local Railways Company has announced an order for 3000 tons of light rails. The current quotation for English pig upon the Belgian markets has been 17. 19s. 6d. per ton. Refining pig hard iron has made 17. 18s. 4d. per ton; ordinary ditto,

17. 15s. per ton; and mixed ditto, 17. 12s. per ton. As regards iron, No. 1 has been quoted at 47. 8s. per ton on export account, and 47. 10s. per ton on home account. No. 2 has brought 47. 12s. per ton, and No. 3, 47. 14s. per ton. The Belgian mechanical concern known as La Metallurgie is engaged upon a very powerful locomotive weighing 75 tons, which is to be shown at an exhibition about to be held at Antwerp, and which is to be afterwards employed in hauling goods trains up heavy inclines. The Prince Albert steamer recently launched by the John Cockerill Company from its Hoboken yard, has gone upon its first voyage to Italy.

The Belgian Coal Trade has presented a firm tone, without at the same time showing any sensible progress. This is not, for the rest, the season of the year when we could expect to see much change. It may, at the same time, be observed that some contracts have been recently renewed at a slight advance upon the prices obtained in the early months of 1884. On the other hand, with March 1 close at hand, and with the winter practically closed, it is natural that many firms should begin to speak again of the fall which is usually witnessed in every spring. The number of trucks carrying coal and coke which passed over the Belgian State Railways in the week ending Feb. 15 was 97,935, showing an increase of 1178 as compared with the corresponding week of 1884. The German coal trade has maintained a pretty firm tone, and prices have been supported at about their former level. The deliveries from the Rhine ports in January presented a considerable falling off, but this was due, to some extent, to interruptions of the navigation. It appears from an official return that the exports of coal from Germany presented a slight increase last year. As compared with 1872 they showed an increase of rather more than 60 per cent., indicating that the production of German coalleries has grown greatly in public favour of late years. The increase in the exports of coke from Germany last year was no less than 2500 per cent. as compared with 1872. The exports of lignite from Germany are also shown to have greatly increased during the last 12 years.

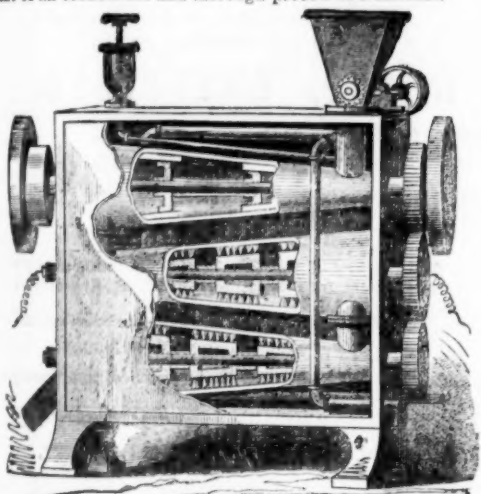
SOUTH STAFFORDSHIRE INSTITUTE OF IRON AND STEEL WORKS' MANAGERS.—Last Saturday night an ordinary monthly meeting of the

members of the above Institute was held in the Geological Museum, Dudley, Mr. W. Hudson presided. Mr. R. Edwards proposed, and Mr. W. Farnworth seconded, a vote of condolence with the family of Mr. S. G. Thomas, recently deceased.—Mr. A. H. Hiorns, lecturer on metallurgy and instructor in practical assaying at the Birmingham and Midland Institute, read a paper "On the action of Phosphorus on Iron and Steel." The reader said the relation of phosphorus to steel and iron was important, because it influenced their physical properties so much, and because it was held so tenaciously by them as to require expensive processes and great labour to dissolve the connection. In future the aim should be to prevent its first introduction into the iron. After alluding to the present means, the reader said he thought the "hearth" might be lined with basic matter, and be so constructed as to be independent of the body, and that dephosphorisation should be effected by an arrangement similar to a Perrot motion. The addition of a certain amount of nitrate of soda would be an advantage. The reader quoted authorities to show that the effect of phosphorus was to raise the limit of elasticity and strength within the crystalline particles of iron, but not to increase the cohesion between the separate crystals. Phosphorus increased the fusibility, and its tendency to crystallise when heated, and if an iron rich in phosphorus had acquired a coarsely crystalline texture by exposure to a strong heat, and not sufficiently stretched afterwards to bring the component crystals together and elongate them so as to develop fibre, it might still prove hard in wear, although neither very extensible nor strong when stretched. The influence of phosphorus on steel was still more prejudicial, and the metal deteriorated with repeated heatings, and soon became incapable of being tempered. Much remained to be learned on the subject, but experience pointed to the earlier steps of the manufacture as the proper place to begin, for iron with much phosphorus was quite inadmissible for large articles. A discussion followed the reading of the paper, and the general expression of opinion was that the paper was a valuable one from a practical as well as a theoretical point of view. Mr. Edwards, Mr. Farnworth, and other gentlemen took part in the discussion, and at its conclusion a vote of thanks was passed to Mr. Hiorns.

## NOVEL ELECTRO METALLURGICAL MACHINE.

PROFESSOR JAMES MANES AND SONS call the attention of miners, mineowners, capitalists, and others interested in the working of gold or silver mines to their new Electro Metallurgical Machine for extracting fine and rusty gold from sands or tailings of stamp mills, or the sands of hydraulic gold diggings, or from the black sands on the coast of Oregon or California, and other parts of the world where gold is found.

The problem that has long troubled the worker of free-milling gold and silver ores is a method to save the mineral now lost in the tailings of stamp mills or flumes. This alone, if it could be saved, would amount to many million dollars profit each year, besides enabling the working of much territory which is now lying idle for want of an economical and thorough process of treatment.



Prof. James Manes and Sons, of Denver, Colorado, U.S., have invented a machine (represented in the above engraving) which it is claimed will save nearly the entire amount of mineral which passes through it, the loss not being over 10 per cent., and in many cases not in excess of half that amount. The machine is a cheap and practical process—it never needs stop for charging or cleaning up, being nearly self-acting. Steam, electricity, and mercury are used in the process of extracting the mineral.

The machine or amalgamator is adapted for free-milling gold or silver ores, or refractory after roasting. It consists of a series of three or more large cylinders, wider at one end than the other, placed one above the other in a horizontal position, a shaft or spindle running through the centre of each. The ore and mercury are fed into the first cylinder, passing into the second, and then to the third. The first cylinder is furnished with steel mullers which nearly touch the sides of the cylinder, and revolve at a good rate of speed, mixing the mercury and ore. The second cylinder is furnished with large steel brushes attached to the shaft or spindle, revolving at a high rate of speed; through this a current of electricity is furnished by a Westinghouse dynamo electric machine, which materially assists in gathering the particles of very fine gold together, and thoroughly amalgamating the metal and mercury. The third cylinder is similarly furnished to the second; into this the amalgam passes, and is again acted upon and mixed by the brushes to catch any gold which might have escaped amalgamation in the second. A fourth cylinder may be used found necessary.

The amalgamated pulp then passes through a revolving copper drum, plated with quicksilver inside. As the drum revolves it takes up the most part of the amalgamated gold. As the inside of the drum is constantly washed with a spray of water from perforated pipes fixed inside of said drum, a clean-plated surface is constantly brought in contact with the pulp or tailings as it passes out from the cylinders. After leaving the drum it falls down on to incline copper plates, the same as is now used in stamp mills.

The amalgam can be collected from the drum and plates without stopping the machine, and any live quicksilver that passes will be caught in syphons. The tailings are carried off with the water. The machine when attached to the flume will be driven by the waste water; it sifts the fine sands from the coarse gravel, and amalgamates it as above.

The specific points claimed by Prof. Manes and Sons in their patent are—  
1.—The saving of almost all the mineral passing through the machine.  
2.—The loss being less than 10 per cent.  
3.—The entire absence of loss of the amalgamated material, thereby saving all the mercury, which, with the processes now in use, there is a large loss both of mercury and the precious metal.

By the small cost per ton at which the ore can be treated.  
By the addition of the powerful current of electricity that passes off the revolving brushes, the most minute particles of gold will be caught and retained, which in the ordinary flume and stamps passes off with the water; this often amounts to a large percentage.  
The inventors state that if English stock companies will give their assistance to work the black sands of Oregon and California by paying for the building of the machines, they will take a share of the gold for their services, or they will send their machines to any part of the world, or will sell patent rights to those desiring any of their patent machines or revolving furnaces for roasting or smelting ores, ball pulverisers, &c.

Prof. James Manes and Sons are agents for the Morey and Spary Ball Pulveriser, that crushes and pulverises at the same time, and does as much work as eight stamps in a day, crushing either wet or dry.

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10 Cash Presents of £5 each . . .	50	500 Gent's Pens and Pencils, 4s. each . . .	2000
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5 Elegant Cabinet Organs, £30 each . . .	150	500 Magic Lanterns, 4s. each . . .	2000
20 Gent's Solid Gold Watches, £25 each . . .	500	500 Boys' Pocket Knives, 4s. each . . .	2000
20 Ladies' Solid Gold Watches, £25 each . . .	500	500 Ladies' Pocket Knives, 4s. each . . .	2000
20 Beautiful Diamond Rings, £25 each . . .	500	1000 Oil Pictures, 4s. each . . .	4000
20 Gent's Solid Silver Watches, £25 each . . .	500	500 Solid Gold Rings, 8s. each . . .	4000
30 Boys' Silver Watches, £25 each . . .	750	1000 Autograph Albums, 4s. each . . .	4000

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The "Golden Argosy," as a publication, has everything in its favour. It is well and clearly printed on good paper, beautifully illustrated, and not the least of its recommendations is the fact, that the literary matter is of a high order, and makes it fit to circulate in any home.—The Liverpool Weekly Advertiser.

The "Golden Argosy"—As the subscription is only two shillings per quarter for an excellent illustrated weekly budget of literature, it is not improbable that the number of their subscribers will soon be enormous.—The Lancashire Guardian.

We think the paper ought to become popular. There are

three good reasons why it should do so, these being—it is well printed and illustrated, the subscription is only eight shillings a year, and the whole space is occupied with reading matter, there being no advertisements. Happy newspaper property, not to require them!—Whitehall Review, London.

The paper abounds with excellent stories, elevating and pure in tone, and with "familiarities" of every imaginable kind, which cannot fail to be productive of mirth and good humour.—Belfast News-Letter.

The "Golden Argosy"—The proprietors of this well-known and highly interesting weekly paper are manifesting considerable enterprise in the undertaking. The publication possesses no ordinary merit.—The Worcester Advertiser.

Its stories are written with vigour, and are all-engrossing reading, being tales of travel and adventure, full of points which are calculated to hold the reader spell-bound. It is also very nicely illustrated.—The Bury Express and Advertiser.

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"I have received three copies of the 'Golden Argosy,' and they far exceed my expectations. I enclose 6s. to make up a year's subscription, and three more receipts."—Mr. DEN BAILY, 18, Princes Street, Glasgow, Gt. Britain.

"I am very much pleased with the 'Argosy.'—Miss EVANS, The Cottage, Wellesley Road, Croydon.

"We like your paper, so enclose you another 2s. to extend our subscription to half a year."—Miss M. MARSHALL, Boston Grove, Boston Spa.

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### GOLD MILLS.

The California pattern of Gold Stamp Mill is universally accepted as the most perfect, economic, and efficient made.

We have over 900 stamps in successful work in the various Western Gold Districts.

### SILVER MILLS.

Silver amalgamation in Pans is essentially an American system evolved after years of work on the rich silver mines of Nevada.

We have over 500 Stamps, with necessary pans, settlers, roasting furnaces, &c., all of our own manufacture, at work in different silver camps of the United States, Mexico, and South America, and Philippine Islands, Asia.

### CONCENTRATION MILLS

Of the most approved German pattern and arrangement, or with Stamps and Frue Vanner Concentrators for low grade silver ores, light in lead. We have over 20 large German pattern mills at work on lead, zinc, or copper ores, and numerous Vanner mills on ores never before successfully concentrated.

Mining Pumps, Cornish pattern, of the largest sizes. Hoisting Engines, from 4 h.p. up to the largest direct-acting engines to sink 3000 feet.

### SMELTING WORKS.

We have 80 Water Jacket Smelting Furnaces in use from 20 in. circular up to 54 in. by 60 in. for lead and silver smelting; and special High Jacket Furnaces for copper ores.

Engines of any size, plain slide valve, Corlies, compound Corlies, Boilers, all sizes. Leaching Mills, Hallidie Wire Rope Tramways, Comet Crusher, with capacity of 12 to 20 tons per hour. White, Howell, Bruckner, and Stetefeldt Roasting Furnaces, &c.

We have had twenty years experience in the manufacture solely of MINING MACHINERY, and have special facilities for shipping to all foreign parts through our New York Office, where all details of clearance, shipment, and insurance are conducted. Our machinery is already well known in Mexico, Peru, Chili, Venezuela, Honduras, and other South American countries.

Correspondence solicited. Descriptive Circulars and Catalogues on application

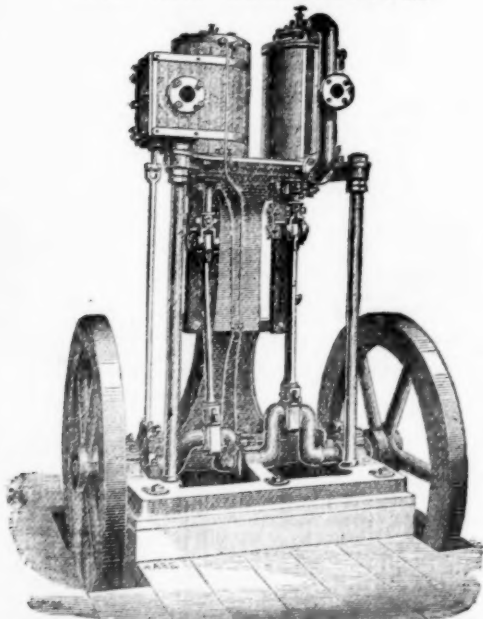
### FRASER AND CHALMERS.

PRINCIPAL OFFICE AND WORKS. NEW YORK OFFICE.

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COLORADO OFFICE—CHEESMAN BLOCK, DENVER.

## THE "Champion" Rock-borer AND AIR COMPRESSOR.



As an instance of the actual work done by this Machinery in various kinds of ground, some of it the hardest rock, it may be mentioned that in Cornwall, irrespective of the work performed by the "Champion" Rock-borers and Air-compressors purchased by various Mines, the drivage, rising, sinking, and stoping done by contract by the Proprietor with his own Machinery now amounts to over 1400 fathoms.

Several of these Air-compressors, ranging from 3½ to 12 tons in weight may be seen in constant work in the Camborne Mining District.

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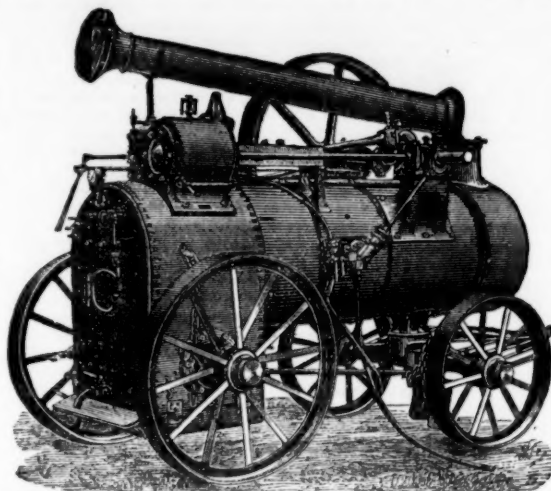
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The Royal Agricultural Society of England have awarded Every First Prize to CLAYTON and SHUTTLEWORTH for Portable and other Steam Engines since 1863, and Prizes at every Meeting at which they have competed since 1849



GOLD MEDAL AND FIRST CLASS CERTIFICATE at the  
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THE ONLY GOLD MEDAL

AWARDED FOR

PORTABLE STEAM ENGINES

### Steam Engines, portable & fixed,

For Coals, Wood, Straw, and every kind of Fuel.

OVER 21,500 SOLD.

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### Straw, Corn, and Hay Elevators.

### Chaff Cutters for Steam Power.

### Grinding Mills.

### Saw Benches.

### Traction Engines, &c.

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Cast Steel for Mining and other Tools, Shear, Blister, and Spring Steel.  
FILES OF SUPERIOR QUALITY.

EDGE TOOLS, HAMMERS, PICKS, AND ALL KINDS OF TOOLS FOR RAILWAYS, COLLIERIES, ENGINEERS, AND CONTRA  
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### SHEAF WORKS, AND SPRING WORKS, SHEFFIELD.

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This unrivalled Explosive, as manufactured by the New and Perfected Machinery of the Company, is perfectly safe for transit, storage, and use, and is employed in every description of Mining or Quarrying Work, for Tunnelling, Pit Sinking, Engineering Work, and Submarine Operations, with the most complete success and satisfaction.

Potentite does NOT contain its own MEANS OF IGNITION, is free from Nitro-Glycerine, and its SAFETY has been special demonstrated by public experiments.

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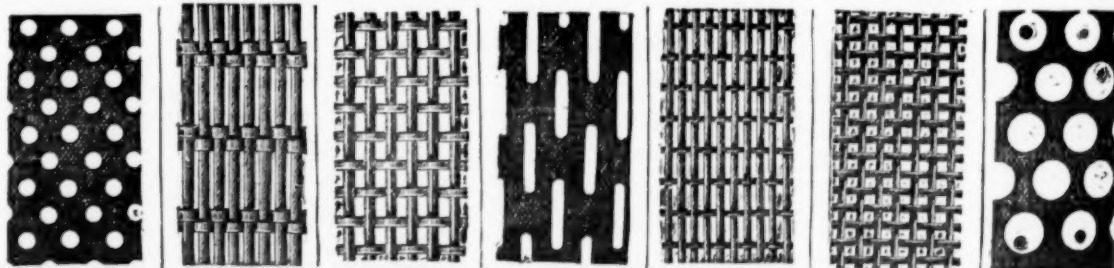
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Wire Manufacturers and Metal Perforators,  
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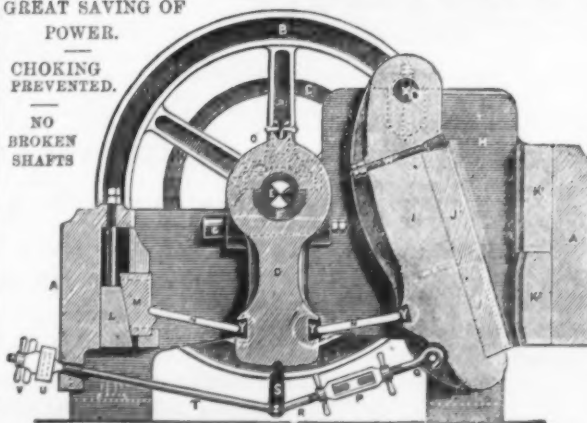
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OF THEIR WELL-KNOWN

### Patent Improved Blake Stonebreakers and Ore Crushers,

With PATENT DRAW-BACK MOTION,

WHICH DISPENSES WITH ALL SPRINGS.  
JAWS adaptable either for CUBING or CRUSHING  
Reversible in Three Sections, with Surfaced Back  
Steel Toggle Cushions.

PRICES, PARTICULARS, AND TESTIMONIALS ON  
APPLICATION.



TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM.

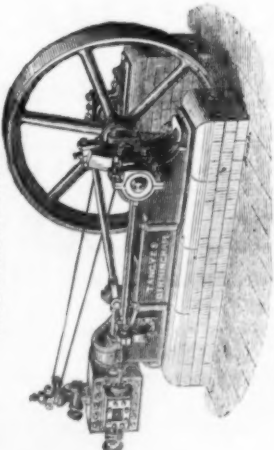
LONDON: 35, Queen Victoria Street.

NEWCASTLE: St. Nicholas Buildings.

MANCHESTER: Deansgate.

GLASGOW: Argyle and Hope Streets.

TANGYES' "BELFAST" STEAM ENGINE, WITH PATENT GOVERNOR.



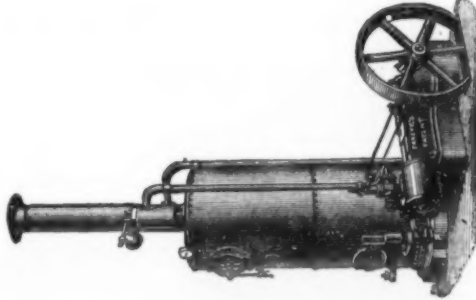
The Engine is self-contained on strong bed plate, has wrought-iron bow crank shaft machined all over, and working in long gun-metal bearings, steel cross head piston rod, and valve spindles, wrought-iron connecting rod and gun-metal adjustable bearings, cylinder steam jacketed, and lagged with sheet steel expansion gear on Meyer's system with hand wheel at back of cylinder for varying gradual expansion while engine is running. Tangyes' patent governor with equilibrium eccentric throttle and stop valve.

Nominal Horse Power	10	14	16
Diam. Steam Cylinder	10	12	13
Length Stroke	18	24	24
Revolutions per Minute	130	125	125
Price of Engine	£ 120	£ 142	£ 155
Variable Expansion Gear	extra	extra	extra
Holding-down Bolt and Plates	4	6	6
Diam. Fly-wheel	65	72	84
Width Face, turned	8	9	9
Diam. Steam Inlet	2	2 1/2	3
Exhaust Outlet	3	3 1/2	4
Weight Engine and Fly-wheel	50	72	75
Fly-wheel only	15	22	24

Feed Pump, not included.

12

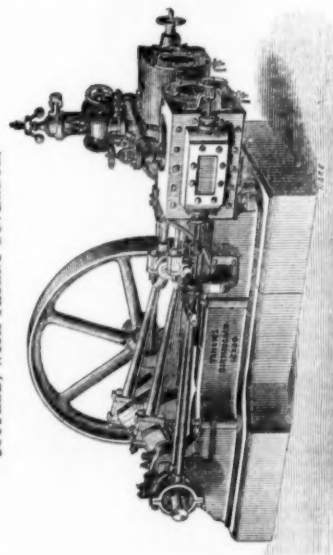
TANGYES' "SOHO" STEAM ENGINE, WITH VERTICAL BOILER, And Patent Governor.



Nominal Horse Power	3	4	6	10	12	14
Diam. Steam Cyl.	5	6 1/2	8	10	11 1/2	12
Revolutions per Minute	240	192	180	150	130	120
Engine and Boiler on 1/2 in. Base with Feed Pump	£ 65	£ 85	£ 105	£ 138	£ 172	£ 200
Diam. Fly-wheel	30	35	40	40	50	54
Width Face, turned	4	5	6	6	8	9
Weight	24	32	44	70	80	95

10

TANGYES' "BELFAST" STEAM ENGINE, COUPLED, WITH PATENT GOVERNOR.



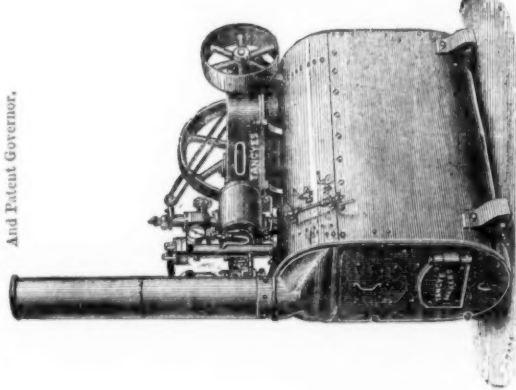
The Illustration represents a pair of the Engines described on previous page. In the Coupled Engines the Crank Shaft works in three long gun metal bearings, each bearing being in three parts, with wedge adjustment.

Nominal Horse Power	20	28	32
Diam. Steam Cylinders	10	12	13
Length Stroke	18	24	24
Revolutions per Minute	130	125	125
Price of Pair Engines	£ 240	£ 284	£ 310
Variable Expansion Gear	extra	extra	extra
Holding-down Bolts and Plates	8	12	12
Diam. Fly-wheel, in halves	65	84	90
Width Face, turned	8	9	10
Diam. Steam Inlet	3	3 1/2	4
Exhaust Outlets (two)	3	3 1/2	4
Weight Engine and Fly-wheel	98	140	150
Fly-wheel only	15	24	20

Feed Pump, not included.

13

TANGYES' "SOHO" STEAM ENGINE, WITH "COLONIAL" TUBULAR BOILER, And Patent Governor.

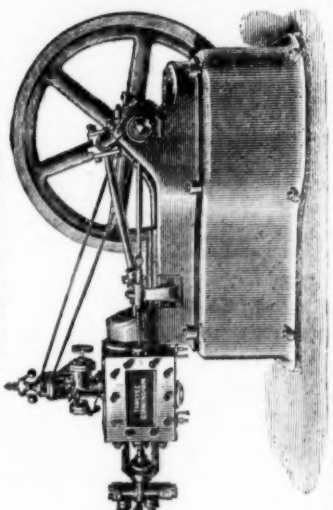


Nominal H.P. of Engine	3	4	6	8	10	12	14
Boiler	240	192	180	150	130	120	110
Diam. Steam Cylinder	5	6 1/2	8	10	11 1/2	12	14
Revolutions per Minute	240	192	180	150	130	120	110
Engine and Boiler with 1/2 in. Base with Feed Pump	£ 76	£ 90	£ 113	£ 135	£ 163	£ 190	£ 210
Diam. Fly-wheel	30	35	40	40	50	54	60
Width Face, turned	4	5	6	6	8	9	10
Length and Width of Boiler	60 x 21 1/2	60 x 27 1/2	60 x 33 1/2	60 x 39 1/2	60 x 45 1/2	60 x 51 1/2	60 x 57 1/2
Heating surface of Boiler	144	176	216	264	312	360	408

Pulley on Fly-wheel Shaft, extra.

17

TANGYES' "COLONIAL" STEAM ENGINE, WITH PATENT GOVERNOR.



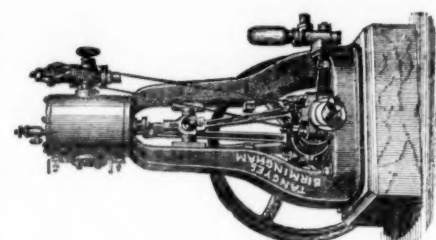
The speed of the Engine can be increased or reduced by simply tightening or releasing the cap which forms the top of the Governor. The Fly-wheel can be put on either end of Fly-wheel Shaft.

Nominal Horse Power	4	6	8
Diam. Steam Cylinder	6 1/2	8	10
Length Stroke	18	24	24
Revolutions per Minute	130	125	125
Price of Engine	£ 20	£ 24	£ 28
Variable Expansion Gear	extra	extra	extra
Holding-down bolts and plates	4	6	6
Diam. Fly-wheel	30	35	40
Width Face, turned	4	5	6
Diam. Steam Inlet	2 1/2	3	3 1/2
Exhaust Outlet	3	3 1/2	4
Weight Engine and Fly-wheel	15	24	28
Fly-wheel only	4	6	8

Cast-iron Base shown in illustration, extra.

14

TANGYES' VERTICAL STEAM ENGINE, DOUBLE STANDARD, WITH PATENT GOVERNOR.

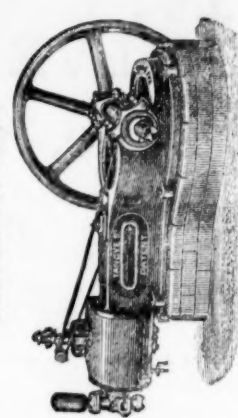


Nominal Horse Power	4	6	8	10	12	14
Diam. Steam Cylinder	6 1/2	8	10	11 1/2	12	14
Revolutions per Minute	190	180	150	130	120	110
Price of Engine	£ 34	£ 45	£ 55	£ 70	£ 88	£ 105
Feed Pump	20/-	25/-	30/-	40/-	40/-	50/-
Holding-down Bolts & Plates	35	40	40	50	54	60
Diam. Fly-wheel	30	35	40	40	50	54
Width Face, turned	4	5	6	6	8	9
Diam. Steam Inlet	2 1/2	3	3 1/2	3 1/2	4	4 1/2
Exhaust Outlet	3	3 1/2	4	4	5	5 1/2
Weight Eng. & Fly-wheel	8 1/2	13 1/2	14 1/2	24 1/2	27 1/2	36 1/2

NOTE.—With each Engine is supplied a Zinc Foundation Template and Oil Catches.

20

TANGYES' "SOHO" STEAM ENGINE, WITH PATENT GOVERNOR.



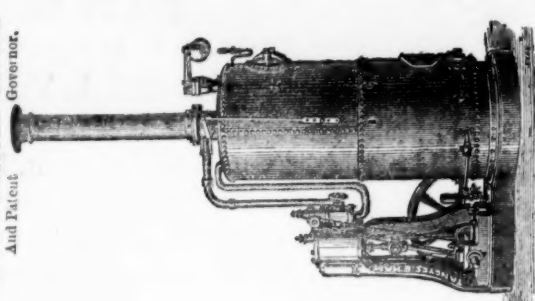
The speed of the Engine can be increased or reduced by simply tightening or releasing the cap which forms the top of the Governor. The Fly-wheel can be put on either end of Fly-wheel Shaft.

Nominal Horse Power	3	4	6	8	10	12	14
Diam. Steam Cylinder	5	6 1/2	8	10	11 1/2	12	14
Revolutions per Minute	240	192	180	150	130	120	110
Price of Engine	£ 25	£ 33	£ 42	£ 52	£ 66	£ 83	£ 95
Feed Pump	11/-	14/-	18/-	22/-	28/-	36/-	40/-
Holding-down Bolts & Plates	30	35	40	40	50	54	60
Diam. Fly-wheel	30	35	40	40	50	54	60
Width Face, turned	4	5	6	6	8	9	10
Diam. Steam Inlet	2 1/2	3	3 1/2	3 1/2	4	4 1/2	4 1/2
Exhaust Outlet	3	3 1/2	4	4	5	5 1/2	5 1/2
Weight Engine and Fly-wheel	50 x 20	60 x 27 1/2	60 x 33 1/2	60 x 39 1/2	60 x 45 1/2	60 x 51 1/2	60 x 57 1/2
Fly-wheel only	4 1/2	7 1/2	12 1/2	12 1/2	20	23	31

Note.—With each Engine is supplied a Zinc Foundation Template and Oil Catcher.

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TANGYES' VERTICAL STEAM ENGINE, DOUBLE STANDARD, WITH VERTICAL BOILER And Patent Governor.



Nominal Horse Power	4	6	8	10	12	14
Diam. Steam Cylinder	6 1/2	8	10	11 1/2	12	14
Revolutions per Minute	190	180	150	130	120	110
Price of Engine	£ 37	£ 47	£ 57	£ 72	£ 89	£ 106
Feed Pump	20/-	25/-	30/-	40/-	40/-	50/-
Holding-down Bolts & Plates	35	40	40	50	54	60
Diam. Fly-wheel	30	35	40	40	50	54
Width Face, turned	4	5	6	6	8	9
Diam. Steam Inlet	2 1/2	3	3 1/2	3 1/2	4	4 1/2
Exhaust Outlet	3	3 1/2	4	4	5	5 1/2
Weight	37	48	62	90	101	125

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## THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTER  
AND ONLY MAKERALSO PATENTER AND ONLY  
MAKER OF THE**H. R. MARSDEN,**  
**NEW PATENT FINE CRUSHER OR PULVERIZER,**

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED.

**GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD,**

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CUBING and CRUSHING  
JAWS, IN FOUR SECTIONS,  
WITH PATENT FACED BACKS, REQUIRING  
NO WHITE METAL IN FIXING.CRUCIBLE CAST-STEEL CONNECTING RODS.  
RENEWABLE TOGGLE CUSHIONS, &c.**OVER 4000 IN USE.**EXTRACTS FROM TESTIMONIALS.  
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

"In reply to your favour, I have much pleasure in informing you that the 12x3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverizing that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20x5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried by hand, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer." "I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &amp;c., &amp;c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.

AWARDED OVER

**60**

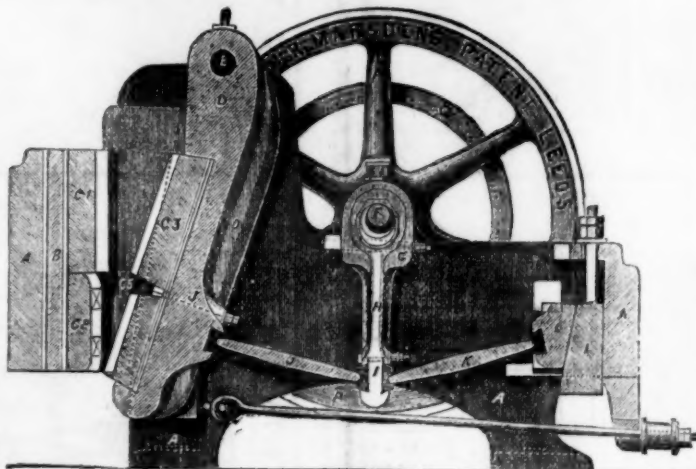
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TRACTORS, MINING COMPANIES, &c., IN ALL  
PARTS OF THE WORLD.ROAD METAL BROKEN EQUAL TO HAND, AT  
ONE-TENTH THE COST.

## EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 x 10, to be at your very best construction, and to include two extra sets of Jaws and Checks for each. The last two 24x13 machines you sent me, which are at work in this colony, are doing very well. You will soon find that the railway contractors will adopt your machines in preference to the colonial ones—two of which I have. I know other contractors have had as many as nine of them, which have not given very good satisfaction. Once they know of yours thoroughly, I believe you will do a good trade with the colonies. For reference of the high character of your constructions you can refer to me as having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, both in point of construction and less liability to go out of order. The material we are crushing is very hard blue stone, for railway ballast purposes. Push on with the order as quickly as possible; I do not think it necessary to have any engineering inspection. I have brought your machines prominently under the notice of all large contractors in this colony, likewise the Government. Many of the contractors have spoken to me in reference to their capabilities, and I could only tell them that they are by far and away the best and most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and two above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

"Some of your testimonials do not give your machines half their due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) in a day than 200 men, and at 1-25th the cost."



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FLY-WHEELS ON BOTH SIDES.

SPECIALITIES ARE HIS

**STEAM PUMPS**  
FOR  
**COLLIERY PURPOSES.**

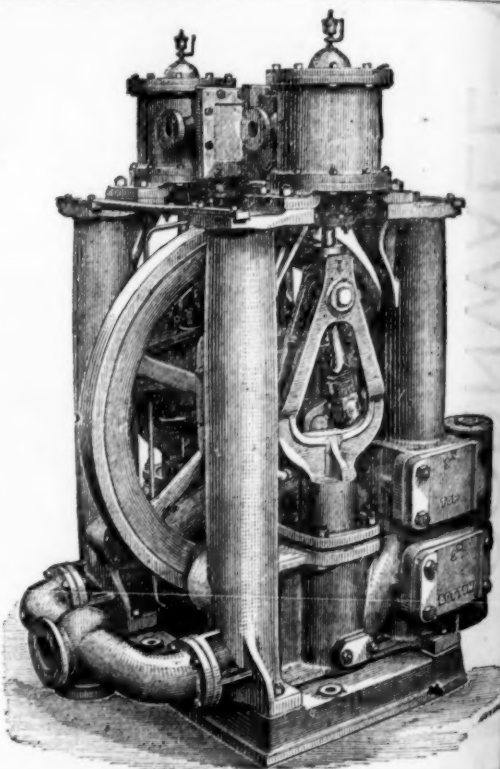
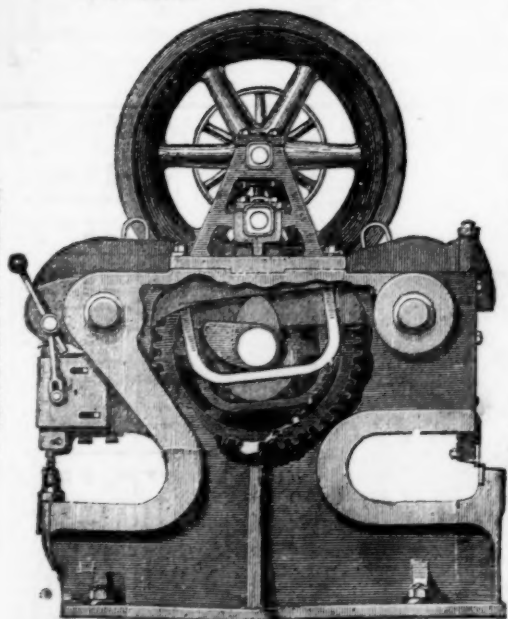
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**SINKING, FEEDING BOILERS AND STEAM  
FIRE ENGINES,**

Of which he has made over 9000.

ALSO, HIS

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52, QUEEN VICTORIA STREET, E.C.  
For NEWCASTLE and EAST COAST—H. BECKWITH and CO.,  
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By a special method of preparation this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

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LONG LANE, SOUTHWARK, LONDON.Prize Medals, 1851, 1855, 1878, for  
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BOILER TUBES**

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FOR EVERY

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**CRANE, INCLINE, AND PIT CHAINS,**Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADE  
FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS,  
RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions

**WELDED STEEL CHAINS { FOR CRANES, INCLINES, MINES, &c.,  
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